The Hallidie Endless Wire Rope-way, Manufactured by California Wire Works, San Francisco ...
Catalogue no.21 pt.1

CATALOGUE No. 21

PART 1.

THE

HALLIDIE WIRE ROPEWAY

MANUFACTURED BY

CALIFORNIA WIRE WORKS

SAN FRANCISCO, CAL.

U. S. A.

1902

PACK ANIMALS.

TRAMWAY.

THE HALLIDIE ENDLESS WIRE ROPEWAY.....

MANUFACTURED BY

California Wire Works

SAN FRANCISCO

CALIF., U. S. A.

1902

SUPPORTING TOWER.

(FRONTISPIECE.)

The Hallidie Endless Wire Ropeway.

The Hallidie Ropeway consists of a single endless moving wire rope passing around horizontal grip pulleys or sheaves at the extremities of the line [Figs. 2 and 3], and being supported at intervals by towers carrying supporting sheaves. [See frontispiece.] To this rope the carriers are securely fastened, and hence as the rope travels it moves the carriers and their loads with it.

A general idea of the main features is given in Figure 1. Near the mouth of the tunnel, and somewhat below it, is the upper terminal of the Ropeway, which contains the grip pulley with the brake and the fair

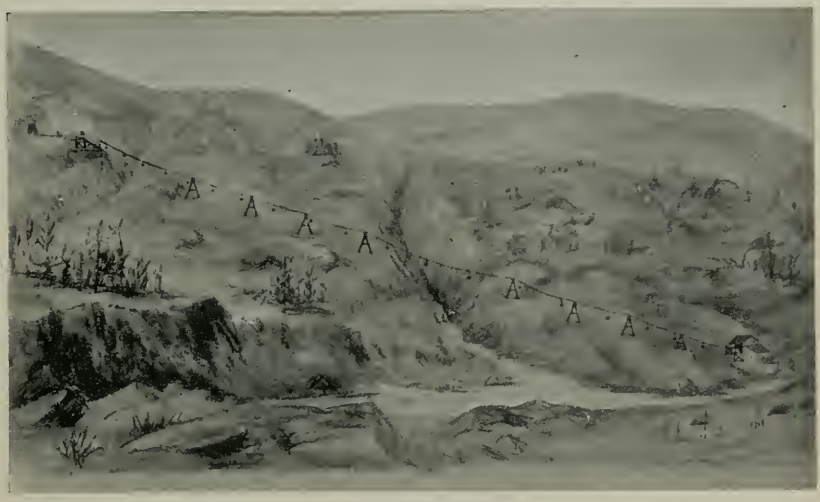


FIGURE 1.

leader sheaves. The ore from the mine is dumped into bins near the Ropeway, and from them loaded either by hand or mechanically [see Figs. 30 and 31] into the moving buckets of the Ropeway. From the terminal the line passes over the sheaves on the towers, which are set one hundred feet or more apart, as the local conditions require. Where there are canyons or valleys to be crossed, the span is increased, as the tension in the rope will lift it so high above the ground that it will be impossible to place a tower. Such a span is shown about the middle of the line in Fig. 1. These spans do not in any way interfere with the working of the line, and we have lines working satisfactorily which contain spans over 2,000 feet long. The lower terminal, containing the horizontal sheave, is placed over the ore bins in such a position that the buckets dump their loads into

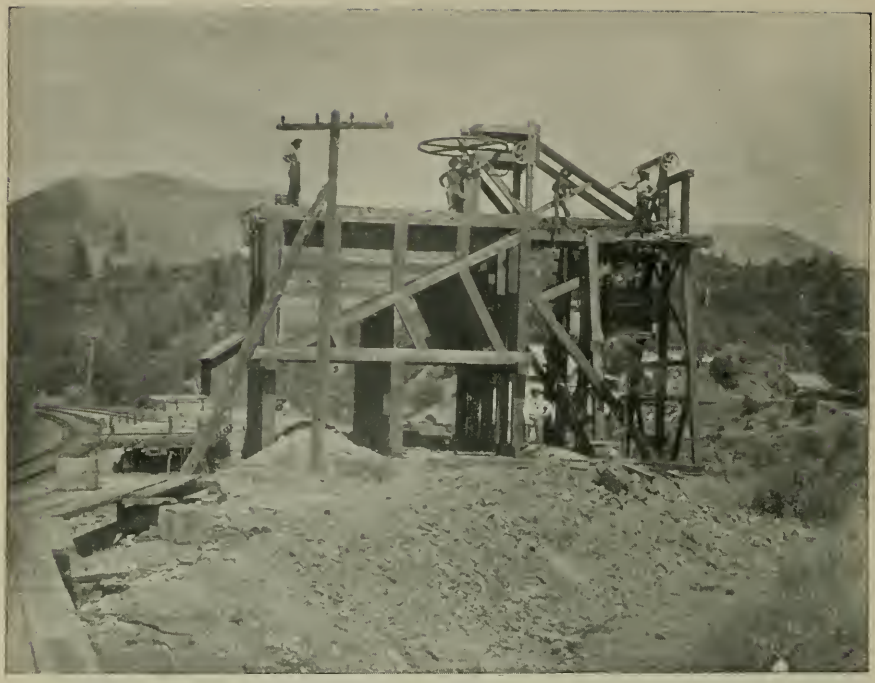


FIG. 2

the bins. From the bins the ore can be sent directly to the milling machinery. Having discharged their loads, the rope and buckets pass around the terminal and up over the sheaves on the other side of the towers to the upper end, where they are reloaded.

The Dead Weight and Cost of the machinery in this system is reduced to a minimum; as there is but one rope employed which travels with the load attached to a clip fixed to the rope, the weight of the material employed in its construction is about 60 per cent. of the weight of the apparatus where the two ropes [Standing and Hauling Ropes] are employed, and consequently cost less in proportion, both in first cost and maintenance.

In transporting the material used in constructing a Ropeway over the trails or roads of the mountains, there is consequently a considerable item of expense saved on transportation and freight alone. (See Figs. 18, 19 and 20.)

The Care of Machinery and apparatus in the mountains, remote from repair shops, mechanics and material, is a matter of serious moment, and any one who has had experience in such a region can fully appreciate this. Reduce the parts liable to get out of order and you reduce the cost

FIG. 3

of maintenance and repairs and increase the efficiency of any apparatus that has to be manipulated largely by unskilled labor.

In the HALLIDIE ROPEWAY every superfluous part is dispensed with ; the Ropeway itself is reduced to a minimum of simplicity.

The Inspection of the Cable is a very simple matter, as the only rope used, and on which so much depends, passes constantly before the eye of the man in charge, who can detect at any time any imperfection or injury existing on any part of the rope.

In a standing or fixed rope this is not the case, as a man has to be sent out to make a special examination, and at best an imperfect one; and where both a standing and a running rope are employed, a separate inspection must be made of each of them.

The Terminal Structures (Figs. 11, 12, 13 and 14), consist of heavy timbers, thoroughly framed and bolted together. To it are fastened the boxes for the end sheave or grip pulley and the castings for the small sheaves or fair leaders that guide the rope on to the large terminal sheave. In most cases we ship only the bolts for the structure, and the timbers are obtained near the site of the Ropeway and framed on the ground. Occasionally we furnish the timber work also, in which case the parts are all

properly marked and the frame knocked down for shipment. Where it is necessary to pack the timbers by mules the long ones are cut in two and furnished with splice plates.

Each terminal frame contains 1,515 feet B. M., making ample allowance for all tenons but none for waste.

The upper terminal is usually anchored securely to the bed rock as shown in Fig. 7, and the rope led out horizontally for loading and until it is high above the ground.

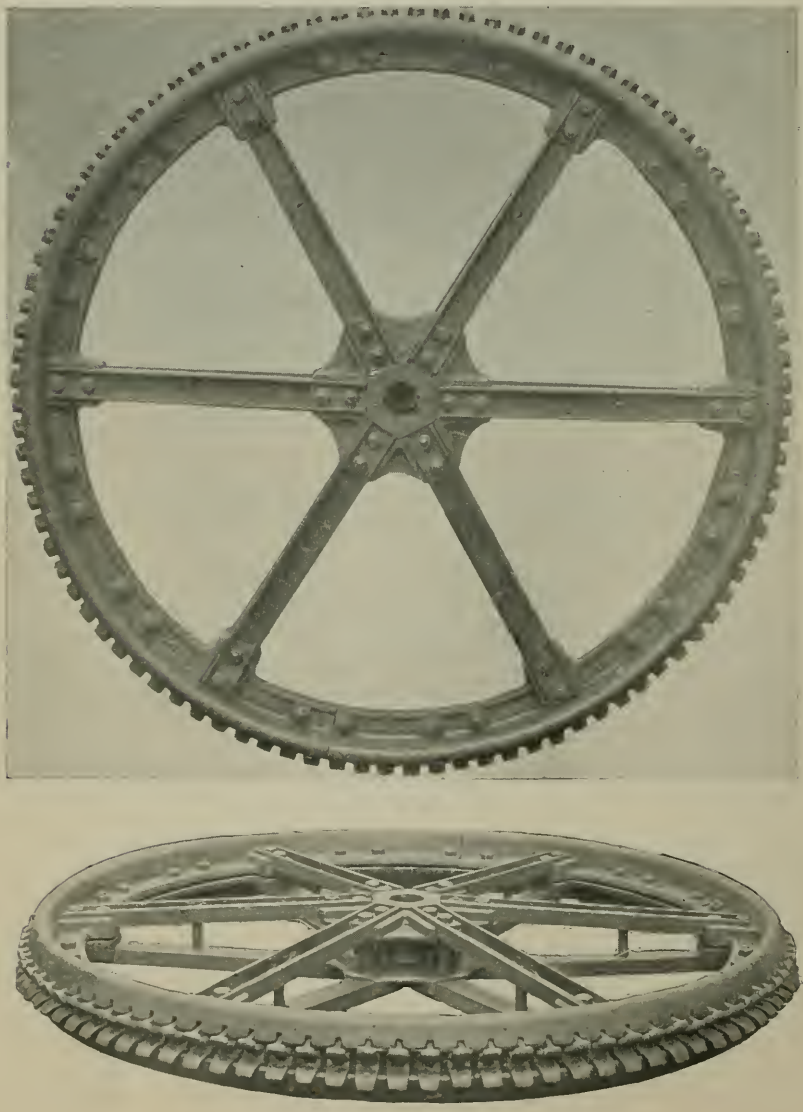


FIG. 4

A set of complete drawings is furnished with each tramway, showing the construction of all the mechanisms.

The Grip Pulley is used to transmit power either to or from the rope. *To* the rope when it is necessary to drive the Ropeway by power, and *from* the rope when a line is operated by gravity and furnishes power to drive other machinery, or the extra power is absorbed by the brake attached to the Grip Pulley. This Pulley has been improved from time to time, and three patents have been issued to Mr. Hallidie for the same, the last of which is dated September 27, 1892.

By referring to Figures 4 and 5 it will be seen that there are a number of grips or hinged jaws attached to the periphery of the pulley into which the rope enters, and pressing on the bottom of the jaws causes them to grip or close over the rope, the amount of gripping power being determined by the length and travel of the jaws and the pressure from the rope.

Formerly the jaws of the grip rested in pockets cast in the periphery of the pulley, but it was found impracticable to get the pockets of uniform depths and many of the grips were useless in consequence. Such a grip pulley is now being made by other tramway companies. In the improved Grip Pulley the pockets are done away with and a continuous groove takes their places, insuring uniformity of distance, duty of every grip,

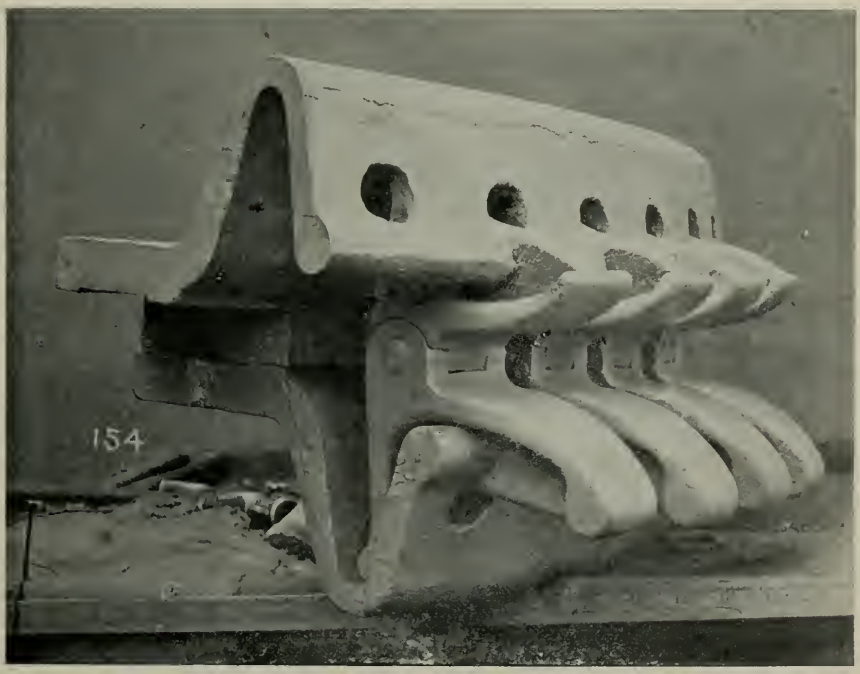
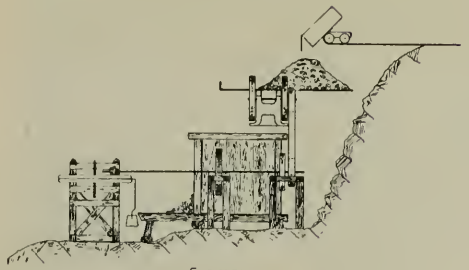


Fig. 5.



ELEVATION
SHOWING END OF TERMINAL

ROCK CRUSHER
DRIVEN BY POWER TAKEN FROM ROPEWAY
LOADING BY HAND

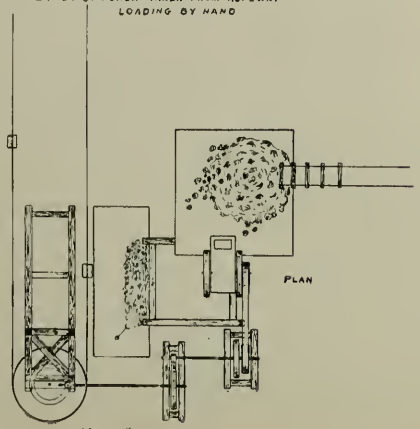
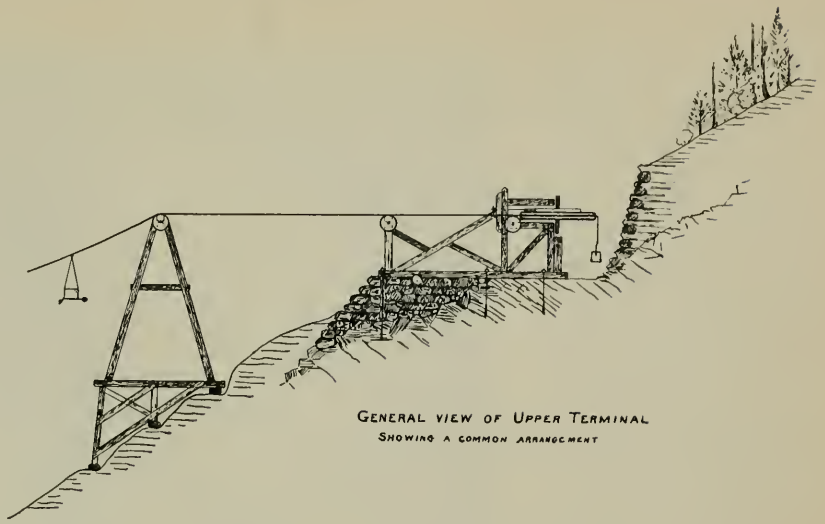


FIG. 6.



GENERAL VIEW OF UPPER TERMINAL
SHOWING A COMMON ARRANGEMENT

SKETCHES OF UPPER TERMINAL
SCALE ½" = 1'
SAN FRANCISCO
DECEMBER 27 1897
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FIG. 7.

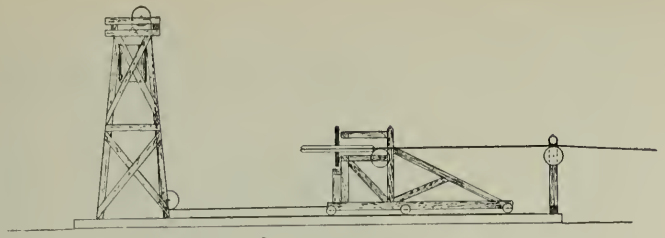

FIG I FLAT COUNTRY
NO FALL FOR WEIGHT

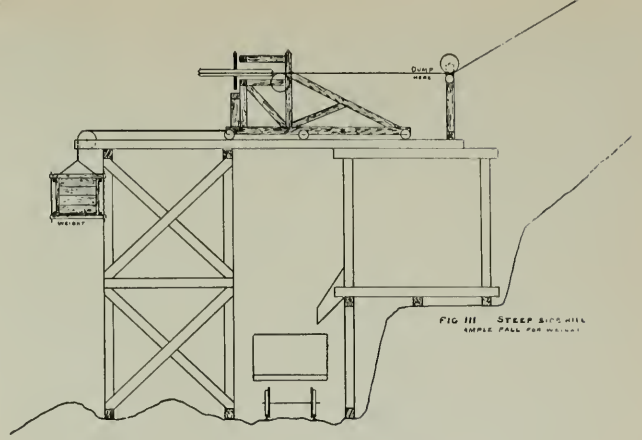

FIG III STEEP SIDE HILL
AMPLE FALL FOR WEIGHT

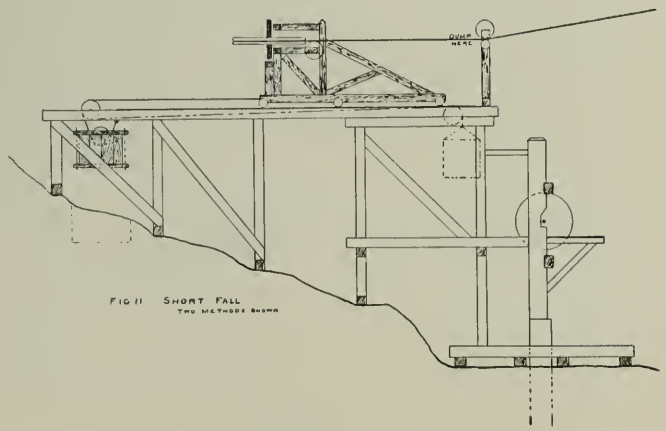

FIG II SHORT FALL
TWO METHODS SHOWN

SKETCHES SHOWING ARRANGEMENTS
OF
TIGHTENING APPARATUS

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FIGS. 8, 9, 10.

FIG. 11.

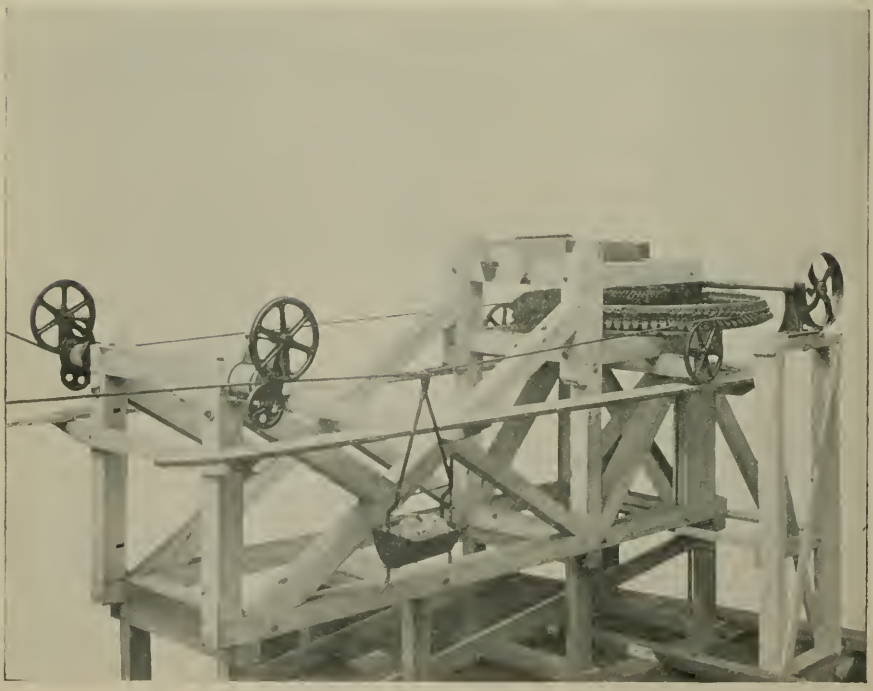


FIG. 12.

and greater simplicity in construction. The grips are held in position by webs cast on them, which fit loosely into slots in the outer edge of the pulley. (See Fig. 5.) The Grip Pulley and attachments are built up of parts which can be separated and put in parcels to pack on mule back, as are all the other parts of the Hallidie Ropeway. (See Figs. 18, 19 and 20.) Every part is marked and can be put together on the ground by an intelligent mechanic.

The power to operate the Ropeway is derived either from the weight of the material being transported, or from some external source of power, be that a line shaft, an engine, a water wheel or other prime mover. (See Figs. 12 and 13.) When the point of discharge is lower than the loading point, and the delivery is five tons or more per hour, the line will operate by the weight of the descending load under ordinary conditions, provided the grade exceeds eight degrees or one fall in seven horizontal.

In such cases the speed of the line is controlled by means of a wood-lined band brake (see Figs. 11 and 14), operated by a hand wheel and screw and clamping the brake wheel bolted to the grip pulley.

For heavy lines a brake may be placed on both sides of the grip pulley, and occasionally a grip pulley and brake are used at the lower end also, but usually in gravity lines a plain sheave is used there. The man having charge of the loading attends to the brake also.

Where the line is on an incline less than eight degrees, or the loading point is lower than the discharge end, it is necessary to supply the line with power from outside, either from the mill shaft or from a special motor. For this purpose a bevel gear is bolted to the grip pulley, instead of brake wheel, and it is driven by a bevel pinion on a countershaft. (See Figs. 12 and 13.)

When the angle of descent is very great, the descending load furnishes sufficient power to carry back and up to the mine such material as may be needed; and, in several lines we have constructed, this saving when taken into account, has been so great that it not only brought the cost of transporting the ore to nothing, but has actually been a source of revenue.

Again, in cases where power is needed at the mine for pumping, crushing ore, etc., the Ropeway can be used either to furnish the power or to transmit it from the mill end. Fig. 6 shows a rock-crusher connected to the grip pulley by gearing and operated by the Ropeway. If the grade is steep enough, the line may generate enough extra power to do this work, but if it does not, the endless rope can be used to transmit the power delivered to a grip pulley at the lower end to the grip pulley at the upper end, to which the machinery can be connected. This work will not interfere in any way with the regular duty of the Ropeway of carrying ore.

The Tightening Apparatus, for keeping the line taunt under all conditions of temperature and load, consists of a strong wooden box filled

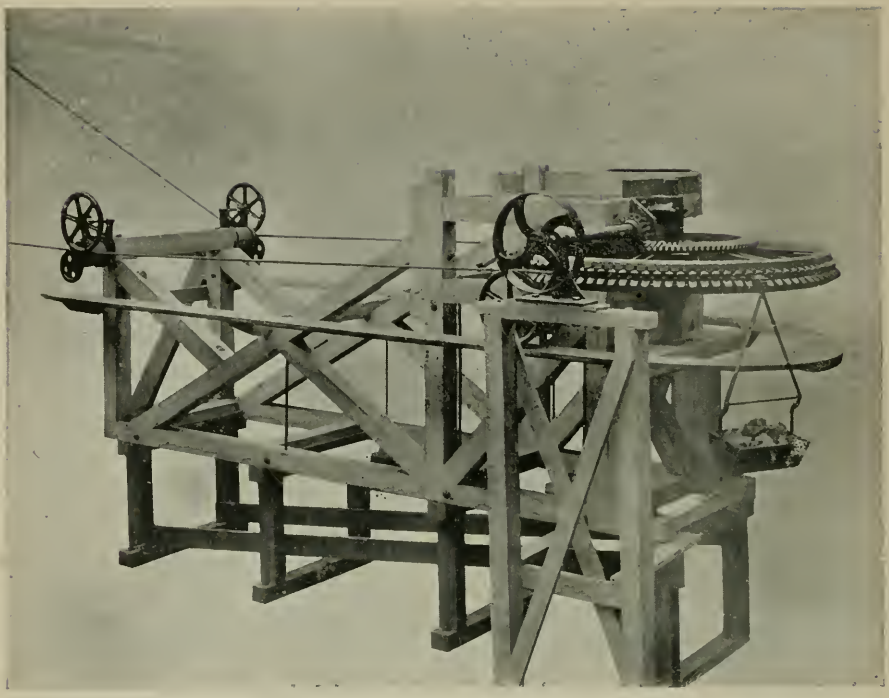


FIG. 13.

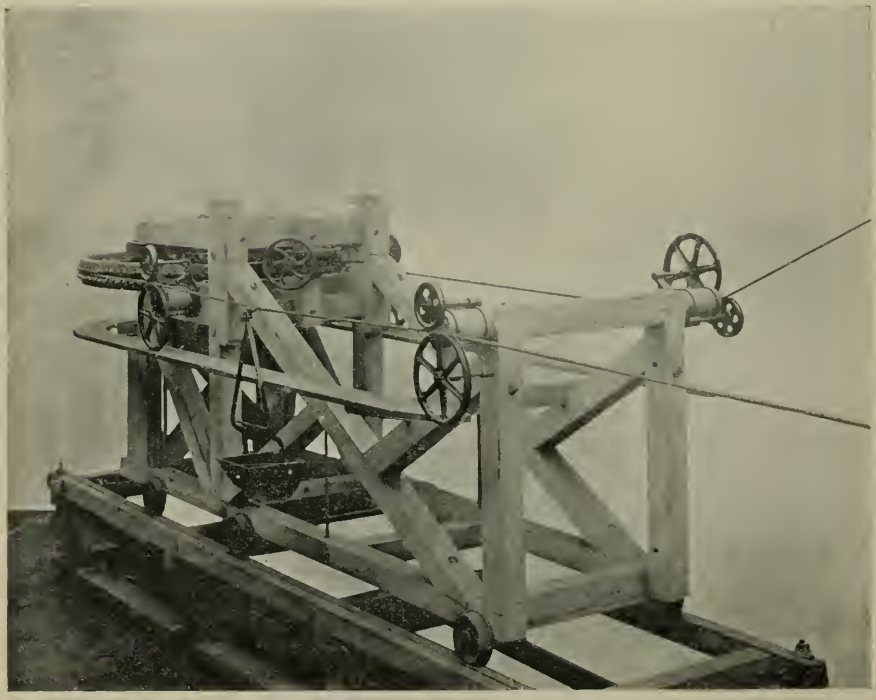


FIG. 14.

FIG. 15.

with rocks or old iron and attached to the end of a wire rope which passes over sheaves, suitably arranged, to the rear of the terminal which is set on wheels running on a track. By this means any slack occuring in the line is taken up by the counterweight. Figures 8, 9 and 10 are sketches of the several ways of arranging the tightening apparatus under the conditions most likely to occur in practice. Illustrations from actual construction are given. (See Figs. 2 and 47.)

The Intermediate Towers are built of substantial timbers generally twenty feet long, making a tower about eighteen feet high. These keep the rope sufficiently high so that the buckets will clear brush or snow.

To the ends of the cross-arms of the towers are fastened the iron station frames which carry the supporting sheaves for the rope. (See front'spiece.) We have a large number of patterns for these sheaves, of various designs and strength, which we use according to the requirements of the case. The grooves of the sheaves are chilled, and are made of a special grade of iron. (See Fig. 43.) Usually, however, the sheaves along the line are 22″ in diameter, but where a sharp angle is made we often use a 30″ sheave.

Figure 15 gives a very good view of one of these towers as built on the Hall Mines Ropeway. (Also see frontispiece.) From its shape this

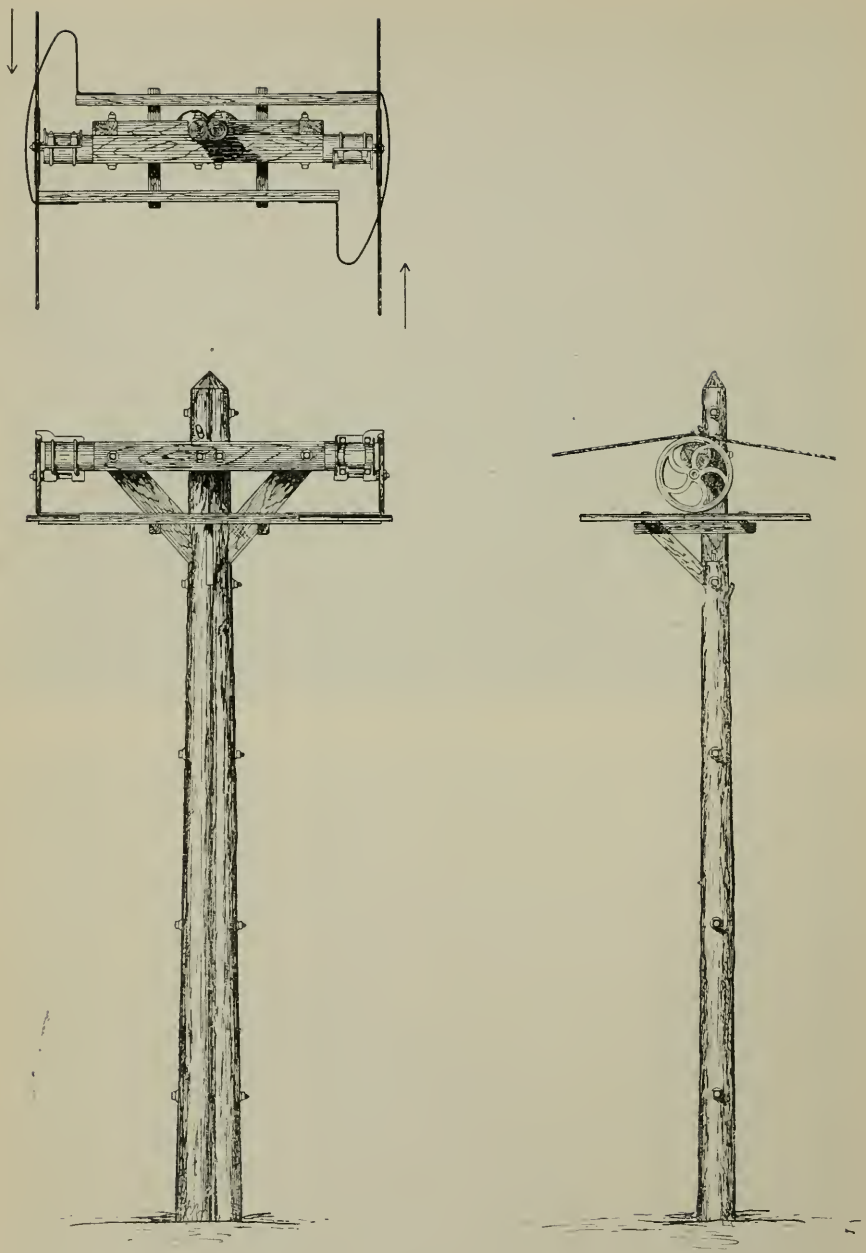


Fig. 16.

form of tower has been nick-named the A X tower, as the side view of it is a perfect A and the end view is an X.

Where the nature of the ground is uneven, a higher station is often needed, as seen in the distance in Figure 15, in which case the regular A X tower is placed on a rectangular base to bring it up to the required height. Such a tower seventy-five feet high is shown in Figure 17. This is a better arrangement than to design a special tower for each place, as all the upper parts can be framed from the same templates and the bases built of rough timber on the site of the towers.

In places where there is danger of snow slides, a simple mast of very heavy timber or a bunch of two or three masts can be set in the ground, a cross-arm set at the top and the whole securely guyed. As this offers less resistance to a slide there are more chances of its dividing and passing around the mast than around a tower with a base twelve or more feet square. If, however, a tower is swept away, the line itself is not injured, the only loss being that of the tower itself.

On very steep bluffs it is sometimes easier to secure a simple X frame by anchoring the base and guying the top than it would be to obtain a footing for the regular towers.

The Rope used on our Ropeways is of the class known as "flexible crucible steel rope," and is usually made of six strands laid around a

FIG. 17.

FIG. 18.

FIG. 19

FIG. 20.

hemp center, and each strand consisting of nineteen wires. The size of the rope is determined by the work to be performed, the usual sizes being ¾″, ⅞″, and 1″ diameter.

The rope is usually shipped on reels holding several thousand feet, but where the upper part of the line is inaccessible to wagons, the rope,

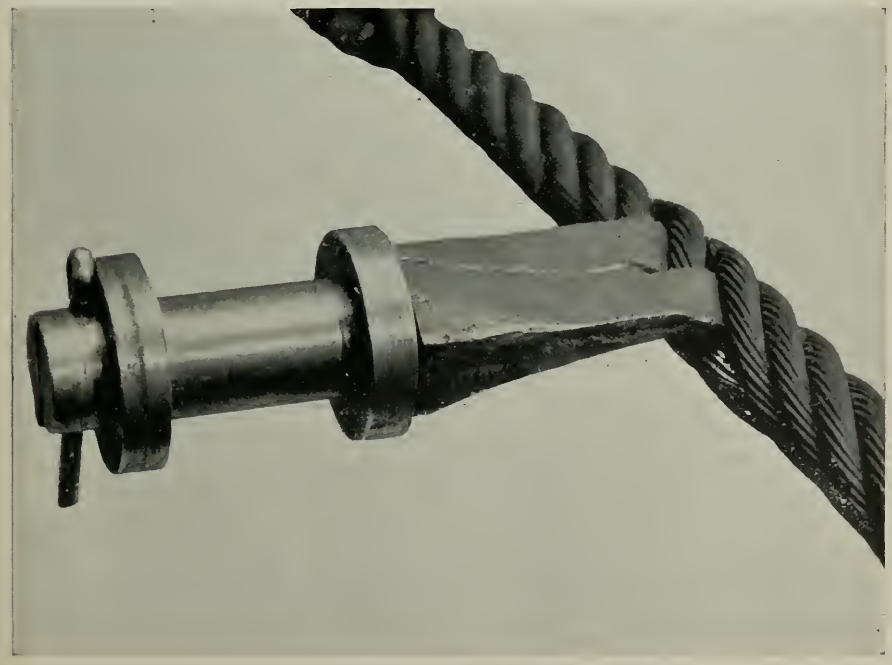


FIG. 21.

like the rest of the machinery, must be packed so that it can be loaded on mules. (See Figs. 18, 19 and 20.) We make a specialty of coiling our cables so that they can be easily transported in this way, even when thousands of feet long and weighing several tons. Figures 18, 19 and 20 are from photographs of trains of mules packing cables along trails. Each animal carries about two hundred and fifty pounds, including the piece of slack rope fifteen or twenty feet long connecting its load to the next one in the rear. This piece is usually held up by a native so that it will not drag on the ground.

In stretching the rope the simplest way is to set up the reel of rope at the upper end and drag the end down the line by means of a mule, and as each station is passed it is raised on to the sheave. When one side is all out the upper end is made fast and the other side is stretched out in like manner. The upper two ends are then spliced together, and after one of the lower ends has been passed around the tower sheave the ropes are drawn up to the proper tension and the last two ends spliced together. The counter-weight rope and box is then attached to the lower terminal and loaded.

While in service the rope should be coated frequently with a mixture of pine tar containing one-tenth raw oil, boiled together and applied warm. Care must be taken not to burn the tar in boiling or its virtue will be lost. This coating lubricates the wires and prevents unnecessary internal wear of the rope.

The Clip is used to attach the loads to the rope, and is so designed that it will pass the end sheaves and also go over the sheaves along the line. (See Figs. 21 and 44.)

The Strap Clip (Fig. 44), patented February 12, 1892, is the result of careful thought, time and experiment. It is made of steel, and consists of five parts—a shank, the leaf or strap, a key, a bolt and a nut. The strap surrounds the rope, and, by means of the bolt and nut and key holds the shank in position. The key is used to tighten up the strap when the rope becomes smaller or the strap becomes larger by wear. The strap, when worn out, is removed by driving out the key and removing the bolt. A new strap is then put on and secured by the bolt and key as before in a very few minutes, and at small cost.

The Center Clip (Fig. 21), patented May 9, 1899, No. 624648, is the most simple clip on the market. It is made in halves and drop-forged. The life of this clip is incalculable.

This clip has been tested under hanging loads, and sustained a load of 2,000 pounds before showing any weakness, and 2,500 pounds before being sufficiently distorted to prevent its passing the station sheaves and horizontal end pulleys.

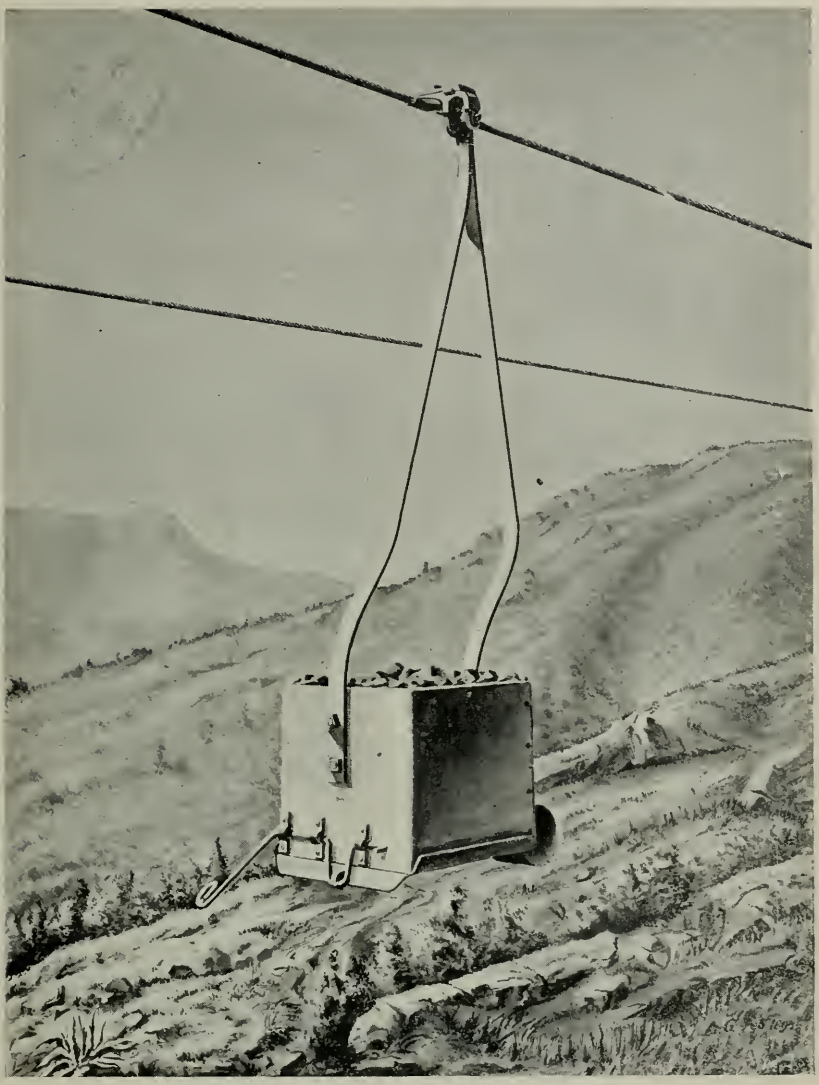


Fig. 22.

The Ore Bucket (Figs. 22 and 29), is self-dumping and is attached by a hanger directly to the lugs of the clips by a bolt and nut. (See Fig. 22.) The carrier complete weighs about seventy pounds, and contains one hundred to one hundred and twenty-five pounds of ore. Under this arrangement the load is fixed to the rope and travels with it, and the carrier is filled while passing and while the rope is moving at a speed of about two and a half to three feet per second. It is not, however, necessary that the load should be fixed to the moving rope, nor that the load

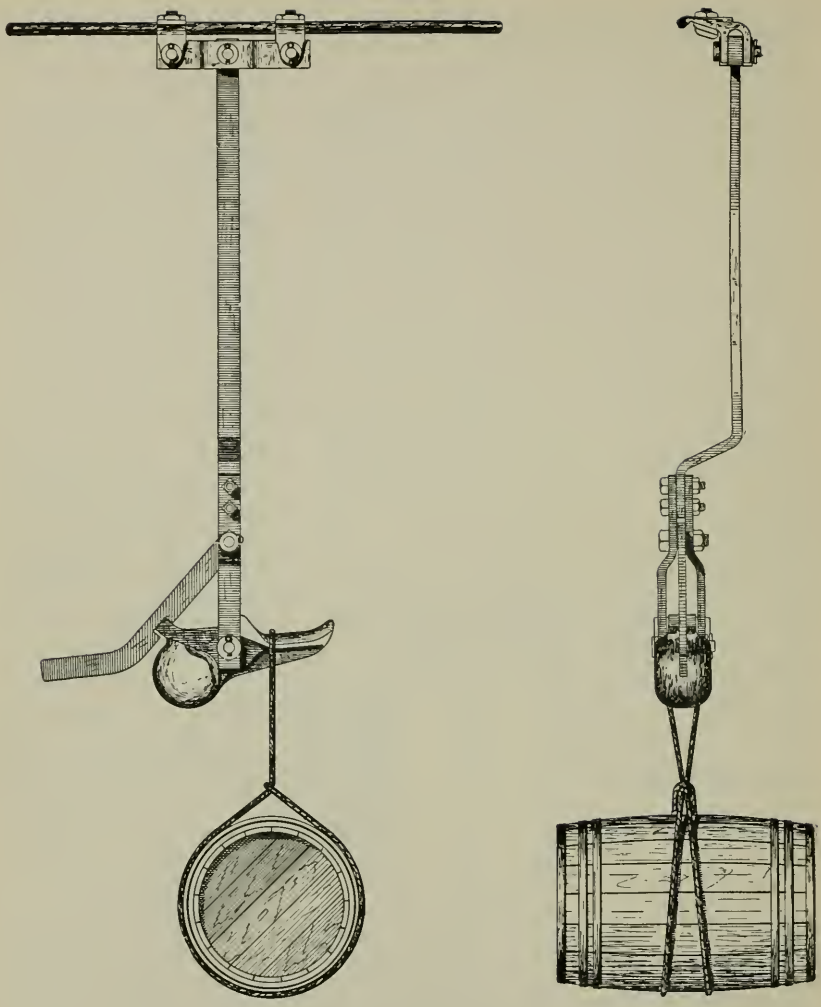


Fig. 23.

should be limited to one hundred pounds in weight, as each clip, as ordinarily made, is capable of holding two hundred and fifty pounds under a factor of safety of eight, and the number of clips can be increased to any reasonable number desired and the load increased in proportion, but the most satisfactory and economical result in delivering ore, or similar material, can be obtained by single loads of from one hundred to two hundred and fifty pounds.

Although the clip is always attached securely to the rope, for the reason that it shall not slip at any angle of the rope, and thus the weight of the descending load is taken advantage of to carry the ascending load,

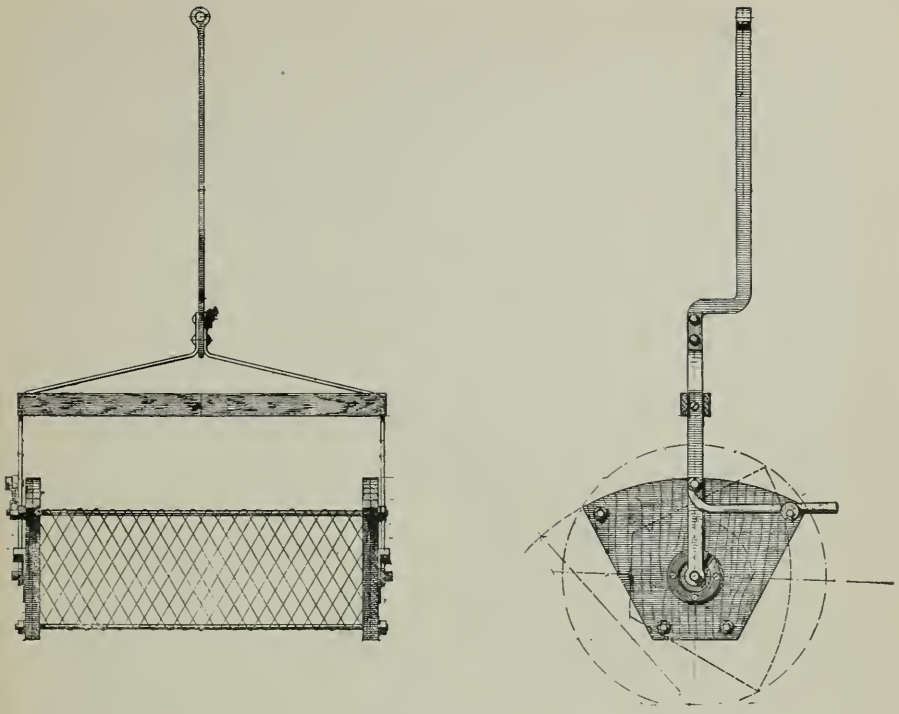


Fig. 24.

Fig. 25.

the carrier and its load can be attached or detached at will by an intermediate connection, and, where heavy loads are transported, this is usually done, and the load run on to and off from the clip-hanger as required.

In addition to the buckets for ore, we make special carriers for special loads. Figure 23 illustrates an automatic dumping sling for a cask. In this case two clips are used, as the load was five hundred pounds. Figure 23 shows the bundle carriers used on the line recently furnished for carrying baggage and supplies over Chilcoot Pass on the route to the famous Klondike district in the Northwest Territory. (See Fig. 39.) Figure 24 is a drawing for a wood or cane basket. It has been used extensively in the Hawaiian Islands for carrying sugar cane. (See Fig. 45.) The carriers are loaded in the field by depressing the rope so that the native laborers can throw in the cane as they pass. They are dumped on the apron at the mill by tripping the latch.

This illustrates a few types of carriers. We make them to meet the requirements of any class of materials. (See Fig. 25.)

In Figure 6 is a sketch of hand-loading platform, bin, etc.

In loading merchandise it is usual to attach by hand, as the varying conditions and shape of the loads prohibit passing them through any mechanism, but where a quantity of the same class of goods is constantly handled, platforms can be arranged to make the operation simple. Figure 27 illustrates a bundle of wire in transit at our factory, having just been loaded from the platform.

The Loading of the Carriers can be done by hand or automatically.

In some cases where the amount to be handled is small, the best way is to dump the ore from the mine on a smooth floor of sheet iron, and then shovel by hand labor directly into the ore carriers as they slowly pass in front of the ore dump, a little above the level of the floor. (See Fig. 6.) The ore carriers move at a speed of about two and a half to three feet per second, and a scoop shovel will fill the carriers with one hundred pounds of ore each. With one man two to three tons can be handled and conveyed over the line each hour.

Where the amount of ore exceeds two or three tons per hour, or the cost of labor is high, the loading may be done mechanically, in which case one man will load ten to twenty-five tons per hour, and can also attend to the brake or driving machinery if conveniently arranged.

The Mechanical Loader manufactured by this Company, and shown in side and end elevation by Figure 30, is the simplest and most efficient mechanical device ever invented for the purpose. There is nothing to get out of order and very little to wear out. It is placed in front of the

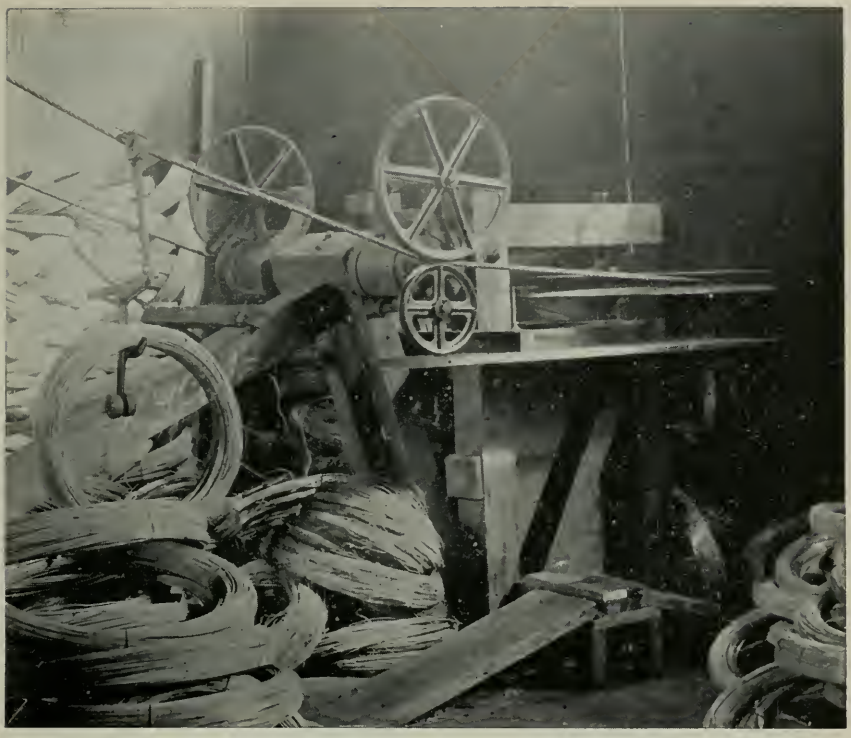


FIG. 27.

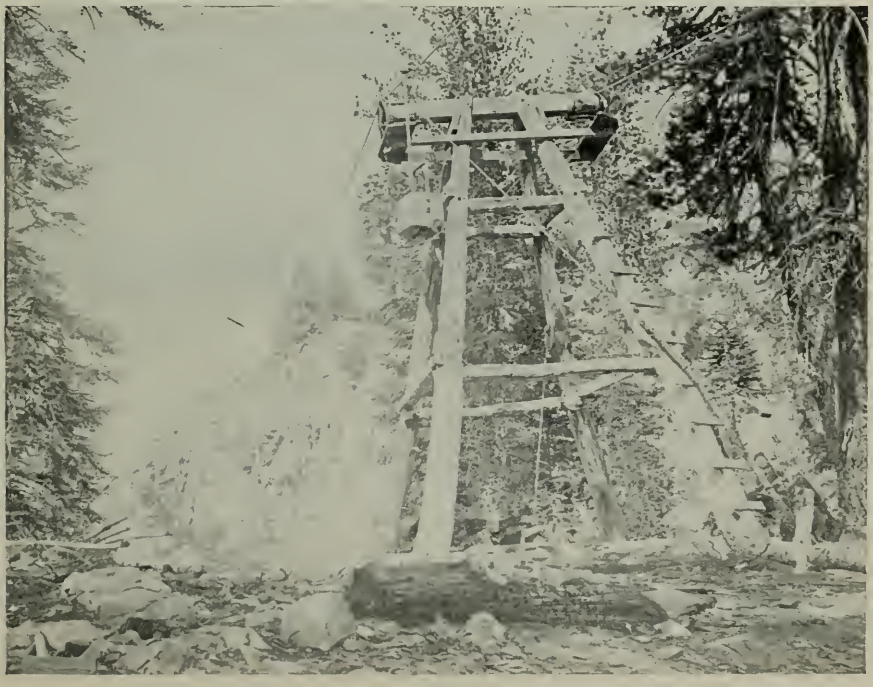


FIG. 28.

FIG. 29.
AUTOMATIC BOTTOM DUMP BUCKET.

ore bin and receives the ore from the chute, whence it is discharged into a loader hopper at the foot of a pendulum. The details of the part that actually do the loading are shown in the photographic view, Figure 31.

The device consists substantially of a pendulum swinging on trunnions about twenty feet above the level of the moving cable. The pendulum is made from sheet-iron tubing twelve inches in diameter. At the lower end is attached a loading box which contains, when loaded, enough

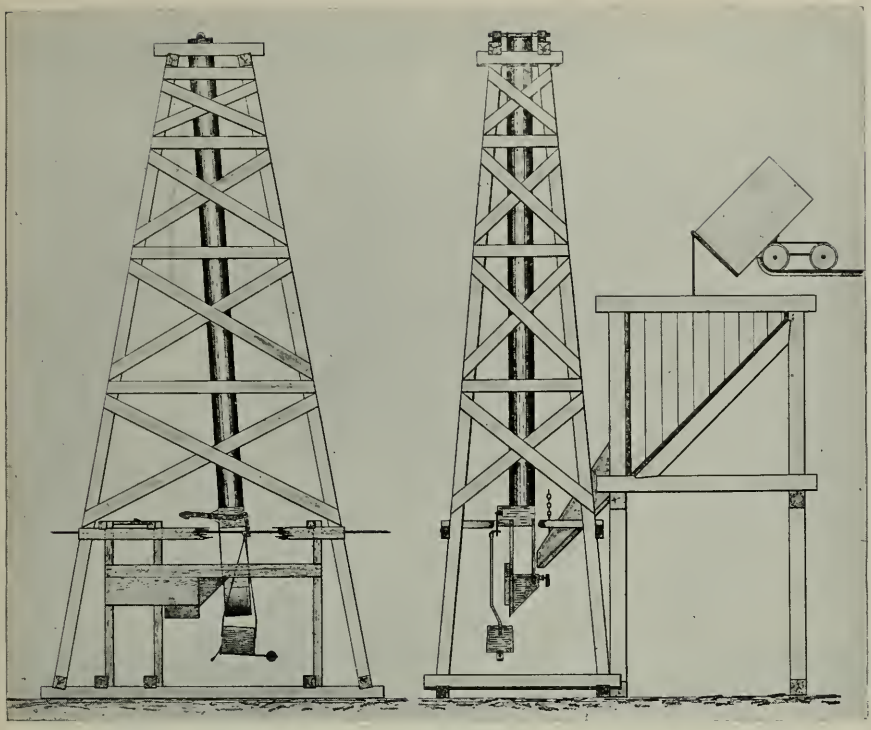


FIG. 30.

ore to fill one carrier of the Ropeway. The loader hopper has two sides, a back and a sloping bottom; the front of the hopper is open. While the hopper is being loaded it is held between a guide and a fixed door or bulkhead, which closes the open front.

The releasing of the hopper box is done by the clip on the moving cable to which the ore carrier is suspended, and which as it moves along strikes the end of a lever which raises the latch off its keeper. At the time the loading box is released the ore carrier is immediately under the nose of the loader box ready to catch the contents of the box. The clip on the moving cable then pushes the hopper out from behind the fixed door, at the same speed as the carrier, and thus opens up the front of the loader box and lets the contents pour into the carrier. The swing of the pendulum raises it sufficiently high after a few feet of travel to clear the rope clip, and the pendulum with the empty hopper swings back by gravity in between the guide and the bulkhead ready to receive another load of ore from the ore bin.

A working model of the mechanical loader in connection with a tramway can be seen at our San Francisco or Seattle office.

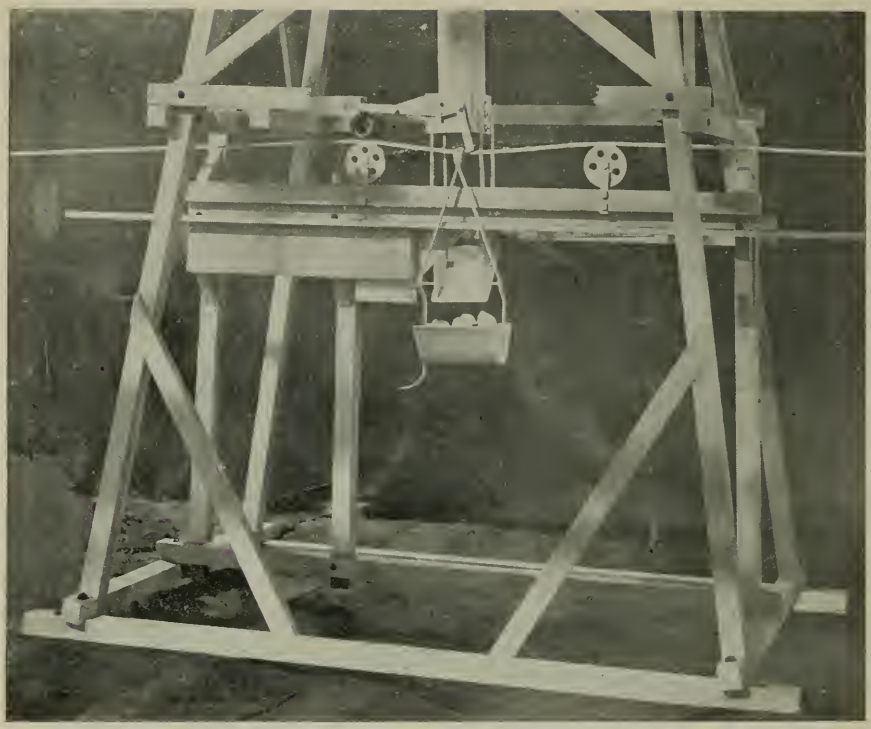


FIG. 31.

Unloading of Carriers is done automatically, with bulk merchandise, ore, etc., by a latch on the carrier striking a trip, but with irregular packages or goods that will not stand dumping, the carriers are unloaded by hand.

Figure 29 shows the regular bottom dump bucket in the act of discharging. The latch has just struck the trip and the weight of the ore has opened the bottom and is discharging itself into bins.

Horizontal Angles are sometimes necessary in order to avoid some obstacle that is easier to go around than to go over, but they should be avoided where practicable, as they add to the cost of construction and usually increase the length of the line. As a general rule it is simpler to run a Ropeway over an elevation than to go around it, because the vertical angle can be made with but slight changes in the machinery and no increase of cost, while the horizontal one requires an angle station of special construction and increases cost.

This is due to the position of the clips and hangers. As they hang on the outside of the rope it is necessary to have all the supporting sheaves and horizontal sheaves on the inner side. When it is necessary for both lines of the Ropeway to turn a horizontal angle the sheaves have

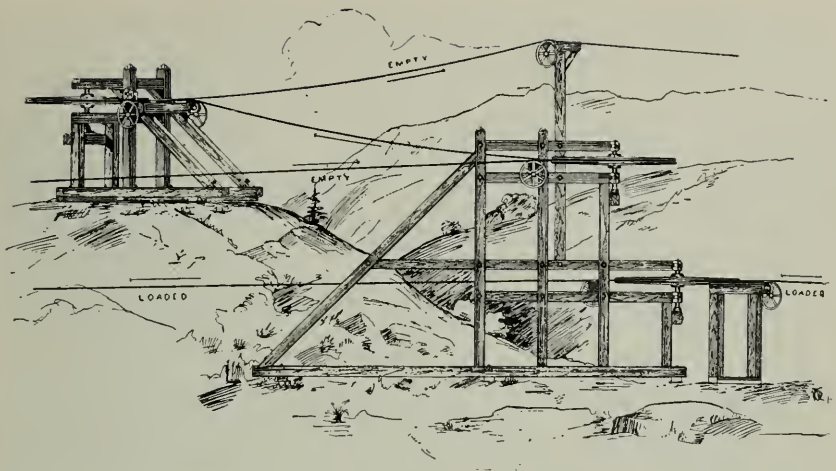


FIG. 31.

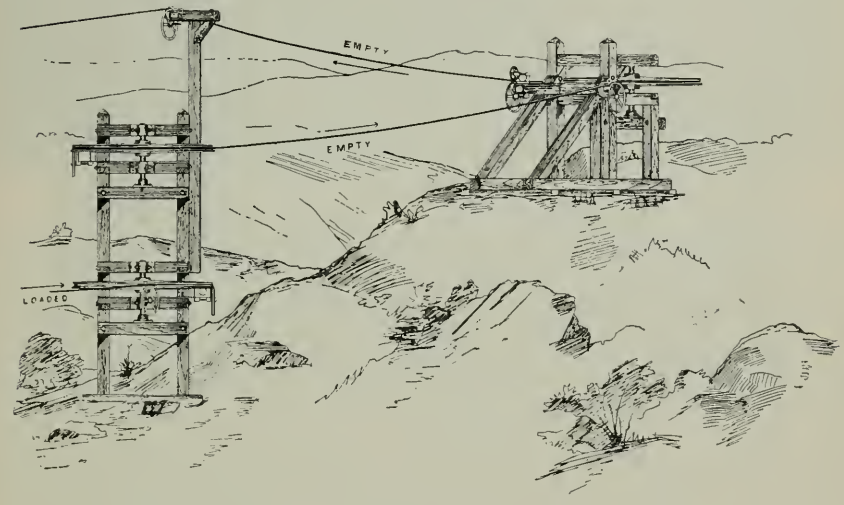


FIG. 33.

to be arranged as in Figures 32 and 33. The rope on the outside of the angle can be carried around a single sheave A, as the hangers will be on the outside, but the inner rope, which should be the empty one, must be carried across and over the other or loaded rope to sheave B, then around it and over to C, then around it and over both the loaded and itself near sheave A, and on to the next regular tower. The ropes have to cross each other so as to clear by seven or eight feet in order to let the buckets pass without fouling the rope beneath. Where the ground will permit, the stations are set so as to get the difference in elevation of the rope by the natural topography of the country, as in Figure 32, but where this is

FIG. 31.

FIG. 35.

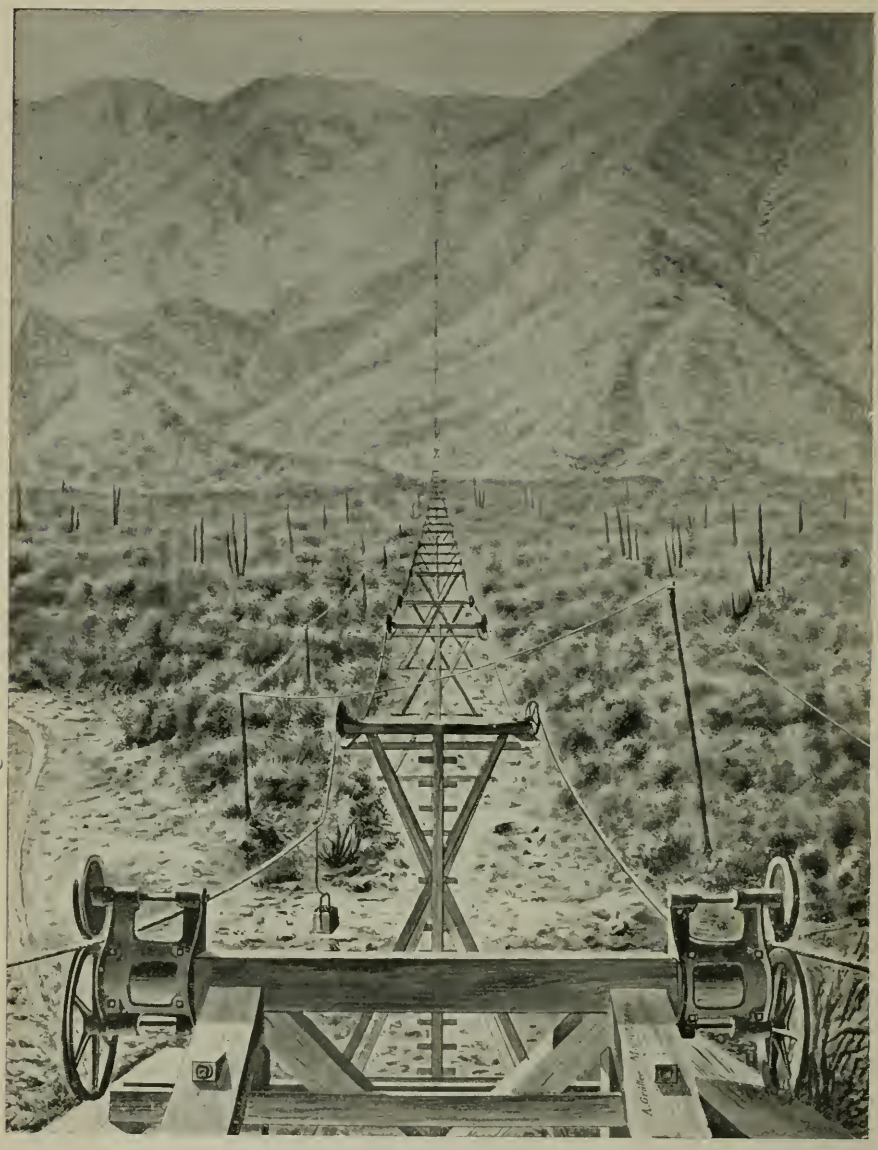
impracticable a special angle tower must be built of the type shown in Figure 33. But each case has to be worked out for itself as each angle varies.

A Profile of the line of the proposed Ropeway should be made from an accurate survey, in order to determine the height and distribution of the towers and the arrangement of the machinery to suit the case best. The profile should be drawn to as large a scale as practicable, and the same scale should be used for both the vertical and horizontal distances. The profile furnishes the foundation for an estimate, and serves as a guide in erecting the Ropeway.

FIG. 36.

Illustrations from Practice. Profile No. 1, in the back of this book, is a profile of the Ropeway for the San Juan Mining Company, 12,360 feet long, and illustrates the principle of placing stations on the high points in the mountainous country, thus practically reducing the broken country to a uniform grade without doing any cutting and filling as in surface roads. On reaching the flatter country at the foot of the hill, the stations are placed at regular intervals, as there are no topographical features to be accommodated.

Profile No. 2 is a profile of the White Cloud Mining Company's Ropeway in Nevada, 3,790 feet long, and illustrates very clearly the ease with which the Ropeway can be made to overcome the enormous irregularities of the country, which for any other means of transportation would form an insurmountable barrier on account of the great cost of construction. How many miles of railroad would it take to bring the ore down



the 1,351 feet which is here done by 3,790 feet of Ropeway? Look at the grading and trestles required for an incline plane along this same profile.

The Longest Line we have built is one for the Hall Mines, British Columbia, which is 23,797 feet long—nearly four and one-half miles. Our Figures 15 and 17 are taken from photographs of this line. Much of the

line is through dense forests, and a path two hundred feet wide had to be cut for the Ropeway as a protection against forest fires and falling trees. This cut is plainly shown in Figure 17.

The line has a fall of 4,100 feet, and transports ten tons per hour during all kinds of weather. The snow reaches a depth of sixteen feet at some places on the line. The system is operated in two sections, each of about two and one-quarter miles length.

Figure 34 shows the large log bin at the upper end of this Ropeway into which the mine cars from several directions dump their ore. This view was taken before the structure was roofed in. In the lower part of this structure is the upper terminal of the Ropeway.

Figure 35 illustrates the bins at the lower end of the line. Here the Ropeway passes over the bins to the terminal seen in the back-ground and dumps its load into whichever bin it is desired by setting the trip.

Extract from article in Nelson, B. C., *Tribune* of August 7, 1897:

"The large copper furnace at the Hall Mines has been running smoothly since being blown in Saturday morning. During the first five days running, up to six o'clock Thursday morning, 2,250,020 pounds of Silver King ore were put through the furnace, producing 215,934 pounds of matte.

"When the big furnace was started there was a good supply of ore in the bins; as the Tramway is bringing down two hundred and ten tons

FIG. 38.

per day, it is thought that a long and profitable run will be made. There is an ore reserve of 3,000 tons at the mine, and if pushed the Tramway can deliver two hundred and seventy-five tons every twenty-four hours."

Extract from the report of the directors of the Hall Mines, Limited, British Columbia, for the year ending September 30, 1897:

"The wire Tramway has continued to give satisfaction, and in May advantage was taken of the opportunity afforded by the closing down of the blast furnace, pending a replenishment of the stock of ore in the ore bins at the mine, to renew the wire rope, and by the introduction of an improved clip strap, permanence and regularity in the working have been assured."

Profile No. 3 illustrates the profile of the Ropeway over the famous Chilcoot Pass, Alaska, on the way to the Klondike gold fields. This will transport the luggage and supplies over the most difficult part of the journey. (See Fig. 39.) The south end is some fifteen or twenty miles from Dyea, the country affording comparatively good traveling, and from the north end the journey is made largely by water through lakes and rivers. The Ropeway displaces some five to ten miles of tortuous and extremely rough trail, over a country covered with massive chunks of rock, dropped from surrounding peaks. In fact the *trail* is so rough that it is impassable for animals, and everything has to be packed over by men

FIG. 39.

FIG. 40.

causing a very serious delay in the trip, while now with a load of one hundred pounds on each bundle carrier, the Ropeway will deliver six tons per hour. Hence the enormous advantage of the Ropeway appears for this place.

Summarizing briefly:—

The foregoing system will work on any level or at any angle, and is applicable, among other purposes:

For conveying ore from the mine to the mill.

For conveying sugar cane from field to mill.

For excavating quantities of earth, sand, etc.

For the construction of dams, levees, embankments, etc.

For conveying large quantities of any material for any considerable distance.

For carrying off debris, slickens, tailings, etc.

For transporting produce, lumber, shingles, shakes, fuel, nitre, coal, etc., across difficult points, and to and from shipping in an offing.

For conveying passengers or materials across gorges, chasms, and over hazardous roads.

For supplying water to reservoirs across chasms.

The advantages claimed are:

No road grading nor building is required.

It can work under all circumstances of weather, with great depth of snow on the ground, during heavy storms and freshets.

It can run constantly without rest; as well during a dark night as on a clear day.

It will work up hill or down hill.

It can cross deep gorges and chasms.

It can pass around precipitous bluffs and perpendicular cliffs or over the most rugged mountains.

It can be applied to grading—either by filling the buckets in the ordinary way, or by using scrapers instead of buckets, on the rope, where the character of the soil will permit.

It can furnish power, when the angle of descent exceeds one in seven, by the gravitation of the descending load of five tons per hour. It can transmit power by means of an engine attached to either end at the same time it is performing its other functions.

It can be constructed and worked cheaper than any other system can be constructed and worked under like circumstances.

FIG. 41.

FIG. 42.

There being only one rope used, the working parts are reduced to a minimum. The carriers being fixed to the rope by means of a patent clip, the material transported can never be lost on the way.

Please bear in mind that we have erected the Hallidie Ropeway during the past twenty-six years throughout the continent of the two Americas, under every conceivable circumstance, and have never made a failure. *We have constructed lines with spans of 2,000 feet, and are prepared to erect this system in competition with any other.* We append herewith some of the testimonials we have received, and shall be pleased to estimate on any proposed line.

We will send a competent man to examine, survey and report on proposed Ropeways, and will furnish close estimates of cost.

We contract for either supplying the material, or supplying material and superintending erection, or for the line complete and in running order.

Our engineers are men of experience and understand the proper construction needed for peculiar conditions and locations. Mine owners

and others can thus avoid the mistakes liable to be made by those inexperienced in this method of transportation.

Our machinery is covered by U. S. Letters patents No. 357664, 422892, 466880, 483442, 558666, 558645, 589654, 597904, 610353, 624648 and 627258, and patents pending; and notice is hereby given that no unlicensed use of the inventions covered by these patents will be permitted.

We solicit correspondence in regard to tramways or any mechanism pertaining to or in relation to wire rope. Our working model of a tramway and loader is on exhibition in our San Francisco and Seattle office, and can be seen working at any time. We also publish pamphlets on the transportation of sugar cane and on excavation by wire rope. If you are interested in any of our lines, we will be pleased to correspond with you in relation to same.

Figure 43 shows the grain of the iron in the rim of the supporting sheaves. The deep chill greatly increases the wearing qualities of the sheave.

FIG. 43.

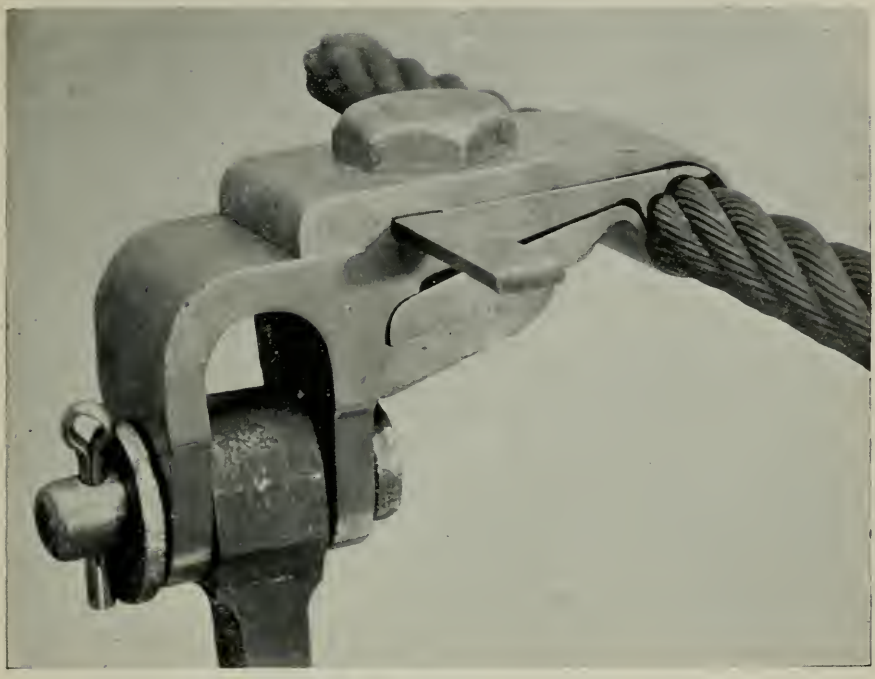


FIG. 44.

TESTIMONIALS AND EXTRACTS

FROM LETTERS WHICH SPEAK FOR THEMSELVES.

Kendrick Tramway,
E. P. Atchison, Prop.

KENDRICK, Idaho, Nov. 19th, 1901.

Messrs. California Wire Works,
San Francisco, Cal.

Gentlemen:—Your favor of the 14th at hand. I had the Brake band put on, and we are now loading every bucket with wheat or apples (boxed) and everything is working nicely. It is pronounced a success by everybody that has seen it work. We are nearly through for this year. Both terminals are under cover and we use it whenever we need to take grain down.

You may refer any one to me that is interested in your tramway, for handling grain in sacks or apples in boxes.

Yours truly,
F. P. ATCHISON.

Emma Hill Consolidated Mining Co.,
Little Cottonwood, Utah.

SUPERINTENDENT'S OFFICE, Sept. 28, 1872.

The Ropeway constructed by you (HALLIDIE'S PATENT) for the Emma Hill Consolidated Mining Company has been built in a most substantial and workmanlike manner, and is at this time in splendid working condition. I most cheerfully accept the work for the Company, and recommend it to others wishing a sure and speedy transit for ores over places impracticable for wagon roads, etc.

Respectfully,

I. U. COLBATH, *Superintendent.*

Office of the Chicago Silver Mining Co.

SALT LAKE CITY, Dec. 1, 1874.

I have pleasure in stating that your Ropeway, put up at the Chicago Mine, Ophir District, Utah Territory, one year ago last summer, has been in constant use ever since, and with the most satisfactory results.

The line, as you are aware, is constructed over an extremely rugged country, one and one-quarter miles in length.

For the first half mile or so it is down a very steep mountain side, whence it passes over the brow of another one; thence it continues down Dry Canyon at an angle of fifteen to eighteen degrees.

The structure is an entire success, the entire cost of which has more than been saved already, although it has not been worked up to half its capacity.

In the estimate of earnings no account was taken of supplies sent to the mine, including water, etc., by no means an inconsiderable item.

Truly yours,

W. S. GODBE,

Manager Chicago S. M. Co. (Limited).

[From the Utah Mining Journal, Salt Lake, Sept. 23, 1872.]

THE VALLEJO ROPEWAY.

The Vallejo Tunnel Company's Tramway, in Little Cottonwood, built on the HALLIDIE'S PATENTED PLAN, is a complete success. It is between 2,300 and 2,400 feet in length, and is supported by thirteen stations. The fall in this distance is about 600 feet, and the wire rope, which is five-eighths of an inch in diameter, will safely and easily deliver 100 tons in six hours. The machinery is automatic, loading or unloading the sacks or buckets. The stations are about 200 feet apart, and the entire apparatus is strong and safe. As the wire rope is elevated about forty feet above the surface of the hill, the Tramway can be worked all winter long without the slightest trouble.

KERNVILLE, Kern County, Cal., May 6, 1878.

Your Patent Wire Ropeway, which I recently erected at the Harley Mine, near this place, works entirely satisfactory, effecting a great saving in the cost of transporting ore from the mine to the mill, and in sending lumber and supplies to the mine. The cost of transporting the ore by pack-train was five dollars per ton—by your Ropeway it does not exceed fifty cents. The length is one mile and a half, the upper end having an elevation of over 3,000 feet above the lower end. It crosses a deep canyon at a height of 300 feet from the surface of the ground, with a single span of 750 feet; and altogether the ground is among the roughest in the Sierra Nevadas.

Respectfully yours,

A. BLATCHLY, M. E.

FIG. 45.

Chemical Laboratory and General Mining Offices,
504 Washington Street.

SAN FRANCISCO, May 15, 1878.

In answer to your inquiry about the "Wire Ropeway," erected by my advice for the Blue Jacket Mining Company, Bull Run District, Elko County, Nev., I have pleasure in stating that under the following conditions it works surpassingly well, and transports the ore by its own weight, without other power, for nearly a mile, over a rough, descending grade of eleven degrees from the mine to the mill, at a cost of about twenty cents per ton, thereby saving at least two dollars per ton, compared with horses.

Yours respectfully,

J. S. PHILLIPS.

Office of the Joab Lawrence Company,
Chas. Read, Sec'y; Joab Lawrence, Pres.

SALT LAKE CITY, Utah, December 1, 1883.

I have been familiar with the working of the HALLIDIE WIRE ROPEWAY, constructed eleven (11) years ago, on the then property of the Emma Hill Consolidated Mining Company, since it was built, aud have had charge of the same the last seven (7) years. It has been in practically continuous use since 1872, and is now in operation almost every day, not only in the transportation of ore, but in carrying mining timbers, lumber, cordwood, coal—in fact, everything used in the mines.

I can heartily recommend the HALLIDIE WIRE ROPEWAY, because its action is simple, it is comparatively inexpensive, both in construction and operation, and is practically unlimited in capacity.

Yours, etc.,

CHAS. READ.

Office of the Standard Consolidated Mining Company.

SAN FRANCISCO, December 6, 1883.

In answer to your request, the Standard Consolidated Mining Company take great pleasure in certifying to the excellence of the HALLIDIE ROPEWAY, which has been in almost continuous use by our company for the past seven years.

During said period your Ropeway has worked to our entire satisfaction, and by it we have transported many thousand tons of ore, etc., from the mine to the mill.

That we are pleased with it is evidenced by the fact that we continue to use it, and, aside from some slight and immaterial modifications, your Ropeway is as it was in 1876, when first erected. Truly yours,

JOHN H. BOYD,
Pres. Standard Con. Mining Co.

KEALIA, Kauai, H. I., June 28, 1883.

In answer to your inquiry concerning the HALLIDIE ROPEWAY erected by you, and now in use on this plantation, for transporting cane from place of growth to the crushing mill, I take great pleasure in replying as follows: The line is about one and one-half miles in length, over a very rough country. It was first put in operation in February, 1882, and since which time it has been almost constantly in use, giving entire satisfaction, and proving itself to be the cheapest means of transportation under like circumstances. The carrying capacity of the line is 240 tons in ten hours. The power required to move the line is taken from the cane engine shaft by employing the proper sized pulleys and belts. The line should be constructed of good material, and, if properly erected, will do its work satisfactorily at all times.

Yours very truly,

WM. BLAISDELL, *Manager.*

FIG. 46.

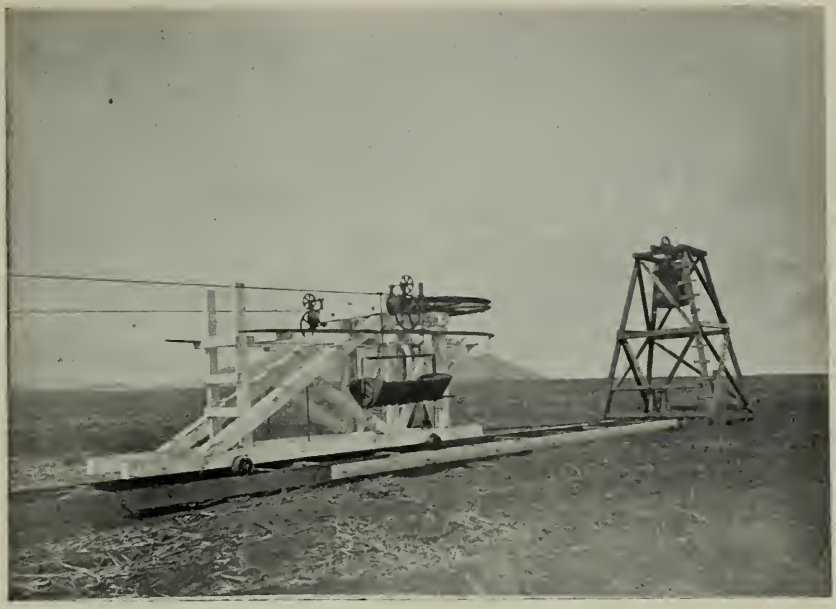


FIG. 47.

KEALIA, Kauai, H. I., June 16, 1882.

The HALLIDIE ROPEWAY erected by you several months ago, on this plantation, is a perfect success, and gives entire satisfaction. When we are able to keep the line supplied with cane, it gives us 2,400 gallons of juice per hour. The line is one and one-quarter miles in length, over some very broken country.

Power to run the Ropeway is taken from the cane engine by bolting on to the fly-wheel arms a 4-foot pulley, then with 40 feet of 10-inch belting over a 60-inch pulley on counter-shaft. The pinion shaft is then put in motion by 10-inch belting over 30-inch pulley on counter and 40-inch pulley on pinion shaft, which moves the Ropeway 187 feet per minute.

With forty pounds of steam, on closing the throttle, without the Ropeway, the engine will make thirty revolutions before stopping; with the Ropeway attached, it will make twenty-six or twenty-seven revolutions—showing that but little power is required to run it. The line has a fall of 135 feet in the whole distance.

Respectfully yours,

JOHN SHERMAN,

Chief Engineer.

PAAUHAU, H. I., January 13, 1882.

I hereby certify that MR. HALLIDIE'S PATENT WIRE ROPEWAY, which you have put up on the Paauhau Plantation for the purpose of delivering sugar-cane to this mill, has given entire satisfaction.

It does fully the work it was represented to do, and delivers easily the quantity of cane stipulated in the contract directly into the cane-carrier. Yours truly,

A. OTTO,

Manager Paauhau Mills, Hawaii.

Pittsburg Consolidated Gold Mines, Limited.

PITTSBURG, Nev., December 26, 1891.

Our ropeway erected by you some years ago has done and is doing good service.

W. A. MERCER, *Manager.*

From San Juan Mining Co., Bahia Angeles, Lower California.

BUTTE, Mont., May 6, 1893.

MR. A. S. HALLIDIE, Pres., San Francisco:

Dear Sir:—As per enclosed receipt, I forward you to-day a photo of part of our tramway line in the "San Juan."

This photo is interesting from the fact that it plainly shows the wire cable from the Lower Terminal up the mountain side to station 18, a distance of nearly two miles. Total length of line is two miles, 1,800 feet. From the last report of superintendent at the mine, the tramway is doing *splendidly*. Fifty-two tons in 9½ hours is, I think, the best work we have done so far, which is quite satisfactory, as you may well believe.

With best wishes for the continued success of the Tram and its inventor,

I am, yours very truly,

(Signed) F. F. CRANZ.

Office of the Jackson and Lakeview Mining Company.

LUNDY, Cal., April 16, 1894.

Gentlemen:—The Hallidie Wire Ropeway, erected for this company in November, 1891, under the supervision of your engineer, Mr. E. I. Parsons, has been in practically continuous use since that time, and has been a success from the start.

The line is over 2,400 feet in length; fitted with grip pulley and brake at either end, supported on fifteen intermediate stations ranging from ten to thirty-four feet in height, and running over a rugged country with a fall of practically one in two.

We have delivered at the mill, using the Ropeway but few hours in the day, over 12,000 tons of ore, and shipping up to the mine hundreds of thousands of feet of lumber and timber, besides all other mining supplies; and all at a very low rate of cost; we ship lumber and timber of any length up to eighteen feet with ease and safety.

The line has been well "kept up," and is now in good working order, at a cost for new parts, repairs, etc., since November, 1891, of less than five hundred dollars ($500).

Yours truly,

(Signed) R. T. PIERCE, *Superintendent.*

PLOMOSAS, Sinaloa, Mex.

Replying to yours concerning the Ropeway for transporting wood and charcoal, erected on this property some two and a half years since, would say as follows: The entire length of the same is about 9,000 feet, has three angles, supported by only ten structures in its entire length, with spans varying from 400 to 1,600 feet in length. The line is erected over some of the most rugged mountainous country in Mexico, and cost, complete and in running order, about $19,000.

[Extract letter of April 15, 1886]:

The cost of wood this year was $35,000, against $52,000 year before, without cable. The cost of $35,000 includes all repairs, etc., since erection. We are ahead of the mill 10,000 yards of wood, and, besides, we have brought down all the charcoal that has been burned in the past year and a half. The wood this year will cost 30 per cent. less than last year.

B. MCINTYRE.

[Extract letter of April 6, 1886]:

As we have stated to you on former occasions, our "Ropeway" still continues to do its work well, and gives every satisfaction. I am informed that the transportation of the ore, including filling the buckets and repairs to Ropeway, has only cost ten cents per ton since erected, three years ago.

E. W. THOMPSON,
For Anglo-Mexican Mining and Land Co.,
Tapacoya, Sinaloa, Mex.

[Extract of letter from Sir Joseph W. Trutch, Managing Director Hall Mines, Ltd., Nelson, B. C., dated March 11, 1898]:

"It gives me much pleasure to state that the Ropeway you built for us has been working most satisfactorily. * * * It has been carrying a good deal more than ten tons an hour and with hardly any interruption. * * * I can only say that as it has been working for the last year, the Hallidie system has done for us more than I expected of it."

The above Ropeway is 23,797 feet long (4½ miles), and in that distance has a fall of over 4,000 feet. It is constructed in two sections; the upper one 10,300 feet long, with a fall of 1,620 feet; is in the storm belt, where snow falls to a depth of twenty feet in places and the wind is very violent. The lower section is 13,500 feet long, with a fall of 2,400 feet. This is in a milder climate and relatively free from great depths of snow.

During the year 1897 the Ropeway conveyed from the mines to the smelting works 49,540 tons of ore.

The Company has decided to increase the capacity to 100,000 tons per annum, by increasing the size of the ore carriers, at a comparatively small outlay.

The Report of the Directors to the Stockholders for the year ending September 30, 1897, states that "The Wire Tramway has continued to give satisfaction."

Office of the Wilmans Mining Co.

SEATTLE, Wash., March 31, 1894.

Gentlemen:—The Hallidie Patent Wire Rope Tramway furnished by you for use at our mines at Monte Cristo has, in every respect, proved entirely satisfactory to us. Our tramway is, I believe, on one of the steepest grades of any line in the United States, and though we have not yet tested it to its capacity, it has done sufficient work to warrant us in recommending it. Yours truly,

(Signed) F. W. WILMANS, *President and Manager.*

[Extract of letter].

MIRAMIR, Costa Rica, C. A., March 6, 1898.

Mr. S. J. Wilkins, representing the California Wire Works of San Francisco:

I am very much pleased at the way the "tram" is working, and see no reason why it should give us the slightest trouble, and cannot but congratulate you on the excellent job you have done for us, which was the harder from being in a foreign land, where your help, almost entirely, spoke in a foreign language.

Yours truly,

W. R. CRANDALL,
Manager Bella Vista Mining & Milling Co.

San Francisco, December 7, 1898.

Messrs. California Wire Works,

330 Market Street, San Francisco, Cal.:

Gentlemen:—I take pleasure in stating that the "Hallidie Wire Ropeway" that you furnished for the "Bella Vista Mining and Milling Company," and which was constructed by Mr. S. J. Wilkins of your city, in Costa Rica, Central America, has given entire satisfaction, and we are thoroughly pleased with it. It was finished in February of this year, and it has been running since that time.

The line is 1,200 feet long, and delivers five tons of ore per hour with ease and economy.

Yours very truly,

(Signed) Edward L. Foutch,

Business Manager The Bella Vista M. & M. Co.

Superintendent's Office, Goleta Consolidated Mining Co.

Jordan, Mono Co., Cal., Oct. 16, 1899.

California Wire Works,

No. 9 Fremont Street, San Francisco, Cal.:

Gentlemen:—The Wire Ropeway purchased from you four years ago has given entire satisfaction. The automatic ore-loader, which was, I believe, the first erected under this patent, saves the labor of two men, or six dollars per day. One man now operates and breaks the tram, sending 60 tons of ore per day to mill, when required, with one-half the buckets on the line and fills the loader at same time. This capacity can be easily increased by adding the other buckets. No one is required at lower end of tram excepting when supplies are sent up. The cost of transportation of ore is five cents per ton.

Yours truly,

(Signed) H. W. Nelson, *Superintendent.*

Extract from letter from R. G. Hart, owner Tex. Con. Mines & Mill, Hart, Shasta Co., Cal.:

January 30, 1894.

I have a Hallidie Transmission Ropeway, one mile long, to transport ore from mine to mill on Sacramento River. It cost me complete about six thousand dollars ($6,000), and we transport fifty tons quartz in ten hours; rope ¾ inch diameter steel wire. Could transport much more by putting on more buckets.

I have used it continuously for three years, and am using it now every day, and can recommend it to any one wanting cheap transportation. It cost me $1.00 per ton to haul with teams. Now it costs 19¾ cents per ton, counting wear and tear for three years to January 1, 1894.

I have no doubt about the Hallidie Ropeway transporting blocks or cordwood at a nominal cost. The roughness of country cuts a small figure.

Very truly yours,

(Signed) R. G. Hart, Sr.

Partial List of Mining and Other Companies

HAVING

HALLIDIE'S PATENT ROPEWAY IN OPERATION

Morning Star, Freiberg, Nevada	1,250 feet
Emma Hill Consolidated, Little Cottonwood	2,400 "
Vallejo Tunnel, Little Cottonwood	2,350 "
Chicago Mine, Ophir District, Nevada	7,100 "
Harley Mine, Kernville, California	7,290 "
Blue Jacket Mining Company, Elko County, Nevada	5,000 "
Standard Mining Company, Bodie, California	2,700 "
Mineral King Mine, Tulare County, California	5,310 "
Rainbow Mine, Sierra County, California	1,710 "
Wertherman's Mine, Durango, Mexico	5,000 "
Surprise Valley Mill and Mining Company, Inyo County, California	3,500 "
Kealia Sugar Plantation, Kauai, Hawaiian Islands, in sections	6,750 "
General Custer Mine, Custer City, Idaho	4,750 "
Columbus Mine, Garfield, Colorado	4,750 "
Mary Murphy Mine, St. Elmo, Colorado	5,250 "
Game Ridge Mill, Rosita, California	3,200 "
Iowa and Colorado Mine, Summitsville, Colorado	5,250 "
Spring Mountain Mine, Camas, Idaho	3,000 "
Hendrie & Bolthoff, Denver, Colorado	3,000 "
South Pueblo Machinery Company, Pueblo, Colorado	5,900 "
Paauhau Plantation, Hawaii, Hawaiian Islands	5,120 "
Brown & Warner, Ames, Ouray County, Colorado	2,706 "
Ramshorn Mining Company, Bay Horse, Idaho	3,450 "
Braden, Smith & Co., Colorado	1,525 "
Moline Tunnel Company, Colorado	2,000 "
Anglo-Mexican M. and L. Company, Tapacoya, Sinaloa, Mexico	1,150 "
Pena & Co., Plomosas, Sinaloa, Mexico	8,889 "
Warriors Mark Mining Company, Colorado	1,928 "

Bullion Smelting Company, Bullionville, Nevada	3,000 feet
Gold King Mining Company, Silverton, Colorado	
Boston and Montana Mining Company, Montana	
La Trinidad Mining Company, Sonora, Mexico	7,920 "
N. G. Arce, Guadalajara, Mexico	3,746 "
Young America Consolidated Mining Company, Sierra County, California	3,250 "
Donaldson Mine, Idaho Springs, Colorado	3,160 "
Champion Mine, Colorado	5,620 "
New York and Honduras Rosario Mining Company, Honduras, C. A.	6,000 "
H. B. Clifford, Guanajuato, Mexico	5,280 "
Rio Grande Mining Company, Kingston, New Mexico	3,000 "
Badigaato Gold and Silver Mining Company, Mexico	3,000 "
Phœnix Gold Mining Company, Sierra County, California	3,000 "
Candelaria Cons. Mexican Mining Company, San Dimas, Durango, Mexico	7,030 "
La Compania Minera de Panuco Sinaloa, Mexico	14,000 "
La Compania, Minera de Cornish, Sinaloa, Mexico	700 "
Pittsburg Consolidated Gold Mines, Ltd., Pittsburg, Nevada	6,536 "
Queen of the West Mining Company, Kokomo, Colorado	1,470 "
Juneau Gold Mining Company, Juneau, Alaska	5,280 "
H. P. Gregory & Co., Sydney, Australia	3,400 "
The Star Mining and Reduction Company of Montana, Mt. Raymond, California	7,600 "
Pride of the Mountain Mining Company, Getchell	
Antonio Mercenario Mina Progreso, near Iguala, Mexico	967 "
Antonio Mercenaric Mina Progreso, near Iguala, Mexico	4,920 "
Hope Mining Company, Mill City, Nevada	1,600 "
Texas and Georgia Company, Redding, California	4,900 "
Milwaukee Mining Company, Ouray, Colorado	2,800 "
Copper King Mining Company, Clifton, Arizona	9,900 "
Jackson and Lakeview Mining Company, Lundy, California	2,400 "
San Juan Mining Company, Bahia Angeles, Lower California	12,365 "
White Cloud Copper Mining Company, Clemens, Nevada	3,790 "
Wilmans Mining Company, Monte Cristo, Washington	4,525 "
Compania Concentradura, La Dura, Sonora, Mexico	606 "
Golden Cord Mining Company, Monte Cristo, Washington	3,000 "
Utica Mining Company, Angels, California	1,500 "
Portola Ropeway, Woodside, San Mateo County, California	7,250 "
Amarillas Mining Company, Torres, Sonora, Mexico	504 "
Creston Colorado Mining Company, Torres, Sonora, Mexico	822 "
Poorman Mining Company, Utah	5,500 "
Reward Mining Company, Independence, Inyo County, California	4,820 "

Hall Mines, Limited, Nelson, British Columbia..... 23,797 feet
F. A. Newton, Guadalajara, Mexico..... 2,600 "
Goleta, Monecito & Sterling Mining Company, Jordan, California..... 1,672 "
Starlight Mining Company, El Dorado, California..... 1,250 "
Consolidated Mining and Smelting Company, Brigham City, Utah..... 8,000 "
Mountain Copper Company, Keswick, California..... 1,280 "
Mammoth-Garfield Mining Company, Whitehouse, California..... 4,825 "
Gold Queen Mining Company, Montecello, Utah ..... 3,212 "
45 Consolidated Mining Company, Silverton, Washington..... 12,880 "
Alaska Railway & Transportation Company, Chilcoot Pass, Alaska..... 8,320 "
Bella Vista Mining & Mineral Company, Miramonte, Costa Rica, C. A... 1,200 "
California and Hawaiian Sugar Refining Company, Crockett, California.. 1,600 "
North Star Mining Company, Grass Valley, California..... 312 "
Lucky Boy Gold Mining Company, Custer City, Idaho..... 3,760 "
Utica Mine, Milton, California..... 1,500 "
London and British Columbia Gold Fields, Ltd., Ymir, B. C..... 2,000 "
Helen Mines, Fort Jones, Siskiyou County, California..... 3,700 "
Don. Maguire, Odgen, Utah..... 4,333 "
Peyton Chemical Works, Martinez, Cal. ..... 400 "
Eastern Oregon Mining Co., Bourne, Baker Co., Oregon..... 7,600 "
Lightner Mining Co., Angles Camp, Cal..... 1,585 "
E. P. Atchison, Kendrick, Idaho..... 2,500 "
Lucky Girl Mine, Whiterock, Nev..... 4,200 "
El Dorado Lumber Co., Placerville, Cal..... 3 000 "
Oceanic Quick Silver Co., Cambria, Cal. ..... 2,500 "
California Mining Co., San Dimas, Mexico..... 1,600 "
W. A. Magee, D. H. Moseley, Agent, Boise, Idaho..... 1,100 "

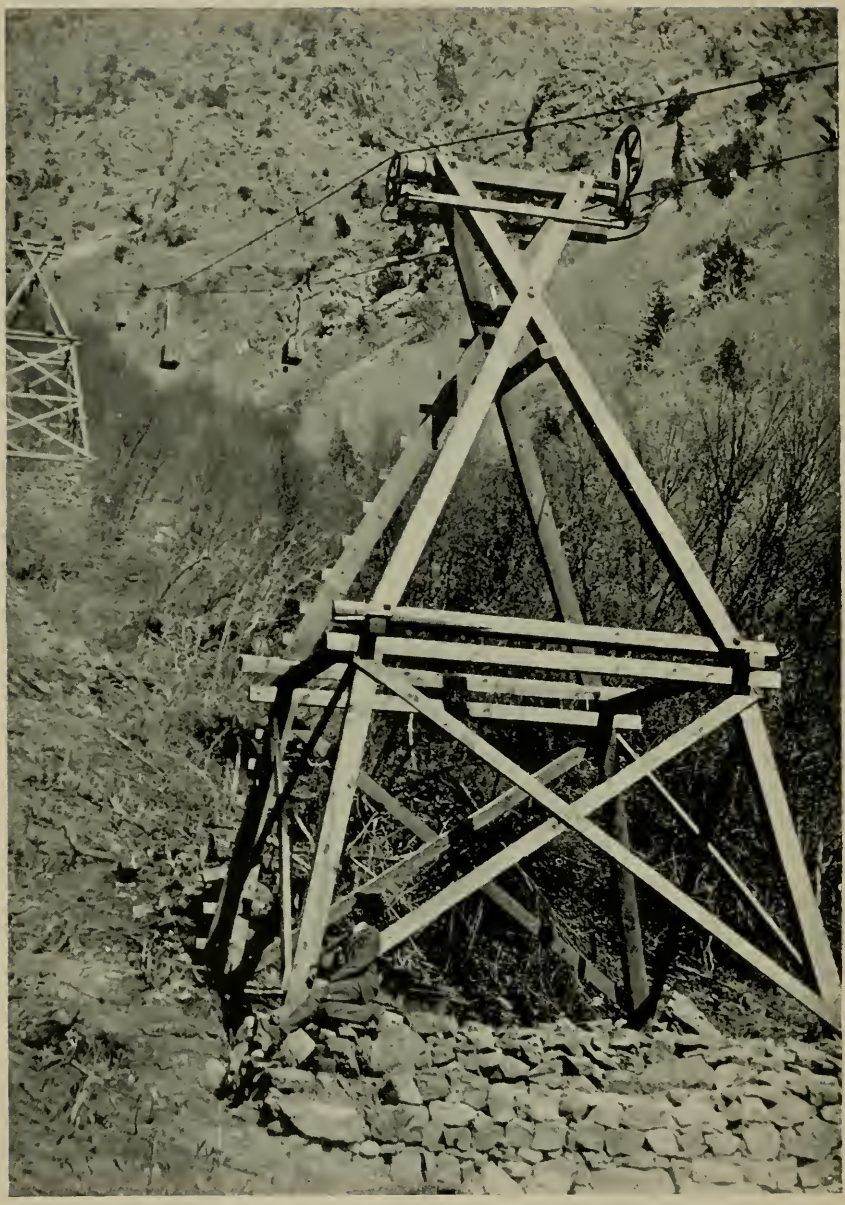


FIG. 48.

Please fill in the following blanks, tear out of book and forward to our address. We can then give you an estimate of cost.

Name of mine or property.....

Location.....

Post-office address.....

Name of corporation or owners.....

Name of Manager or Superintendent.....

Distance from and name of the nearest railway station or sea-port.....

Length of propnsed Ropeway.....

Difference in level of ends.....

Which end is higher, the receiving or delivery?.....

Quantity and character of material to be delivered per hour.....

Quantity and character of material (if any) to be returned per hour.....

Character of country on the route of proposed Ropeway.....

Number of cañons, and length of spans, exceeding 200 feet.....

Does snow fall? If so, depth .....

Mode of transportation from railroad or port to Ropeway site.....

Cost of transportation from railroad or port to Ropeway site.....

Cost of timber and lumber at site.....

Wages of mechanics per day..... Wages of laborers per day.....

Mechanical loader wanted or not .....

Please add any further information.....

.....

.....

Dated at.....

In order to make estimate of cost, a survey of route should be made by a competent engineer. A straight line should be maintained between ends if possible. It is usually more economical to go over a hill than around it.

Send us your engineer's profile and topographical plan of survey, or we can send a competent and experienced engineer to survey and locate line.

PROFILE NO. 1

LONGITUDINAL PROFILE

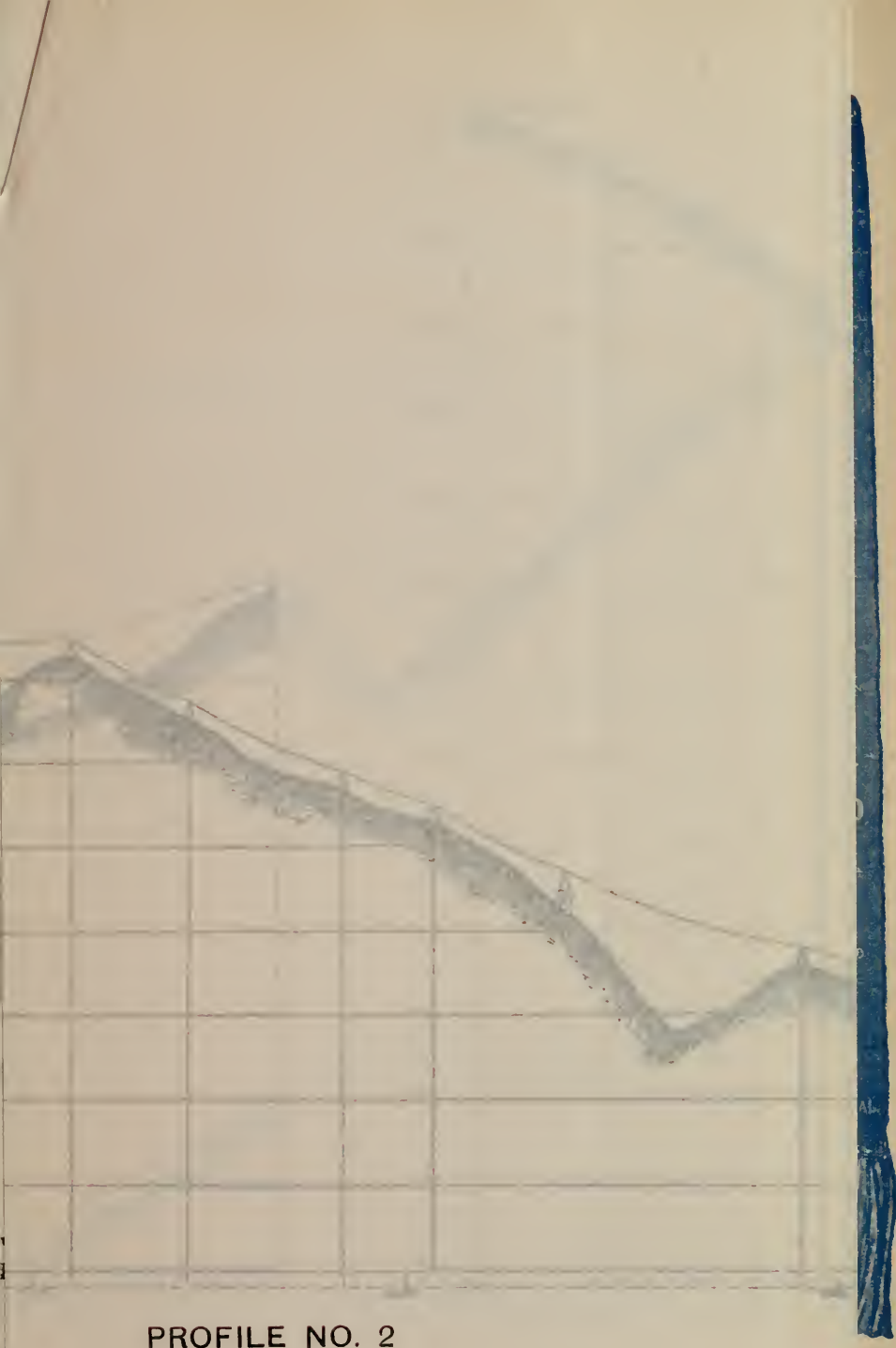
OF

„HALLIDIE" ROPE-WAY

ERECTED FOR SAN JUAN MINING COMPANY AT
BAHIA ANGELES, BAJA CALIFORNIA MEX.

Same Scale for Horizontals and Verticals

San Francisco April 1894



PROFILE NO. 2

LONGITUDINAL PROFILE

OF

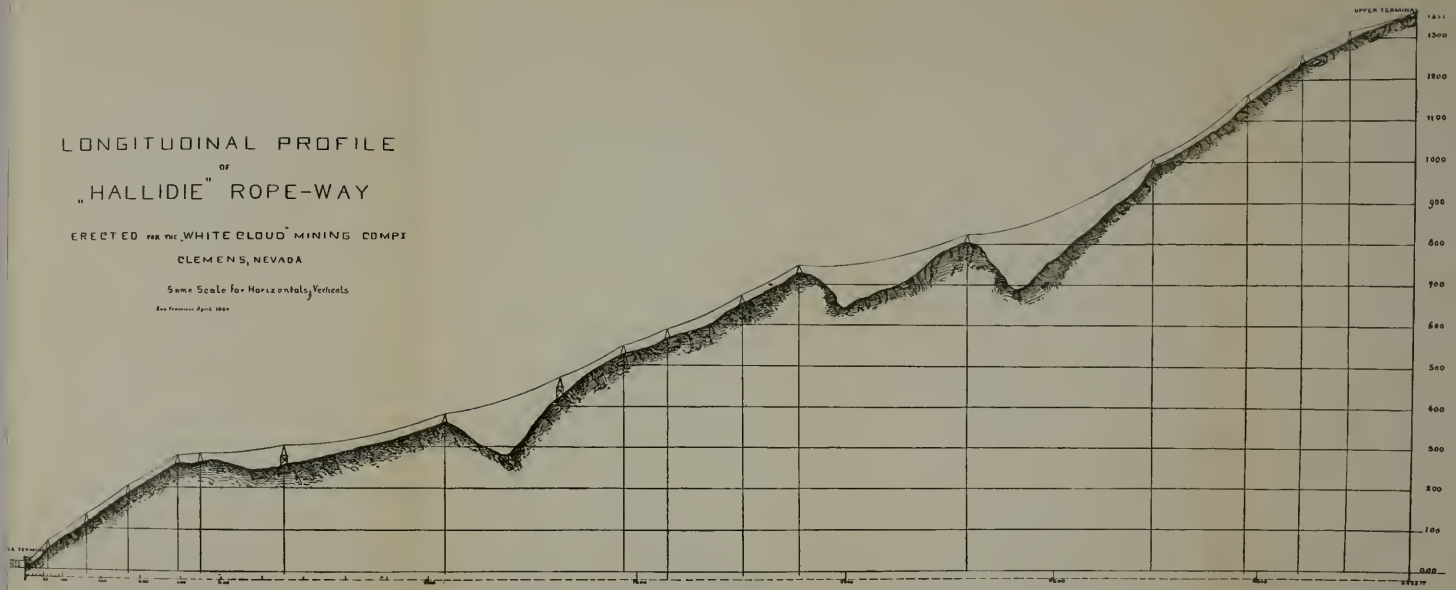
„HALLIDIE" ROPE-WAY

ERECTED FOR THE „WHITE CLOUD" MINING COMP.

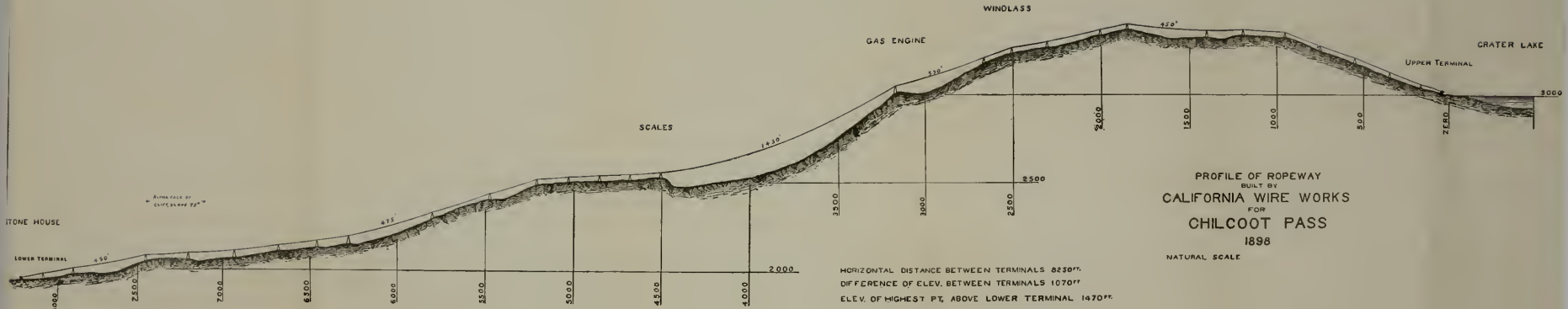
CLEMENS, NEVADA

Same Scale for Horizontals & Verticals

San Francisco April 1890



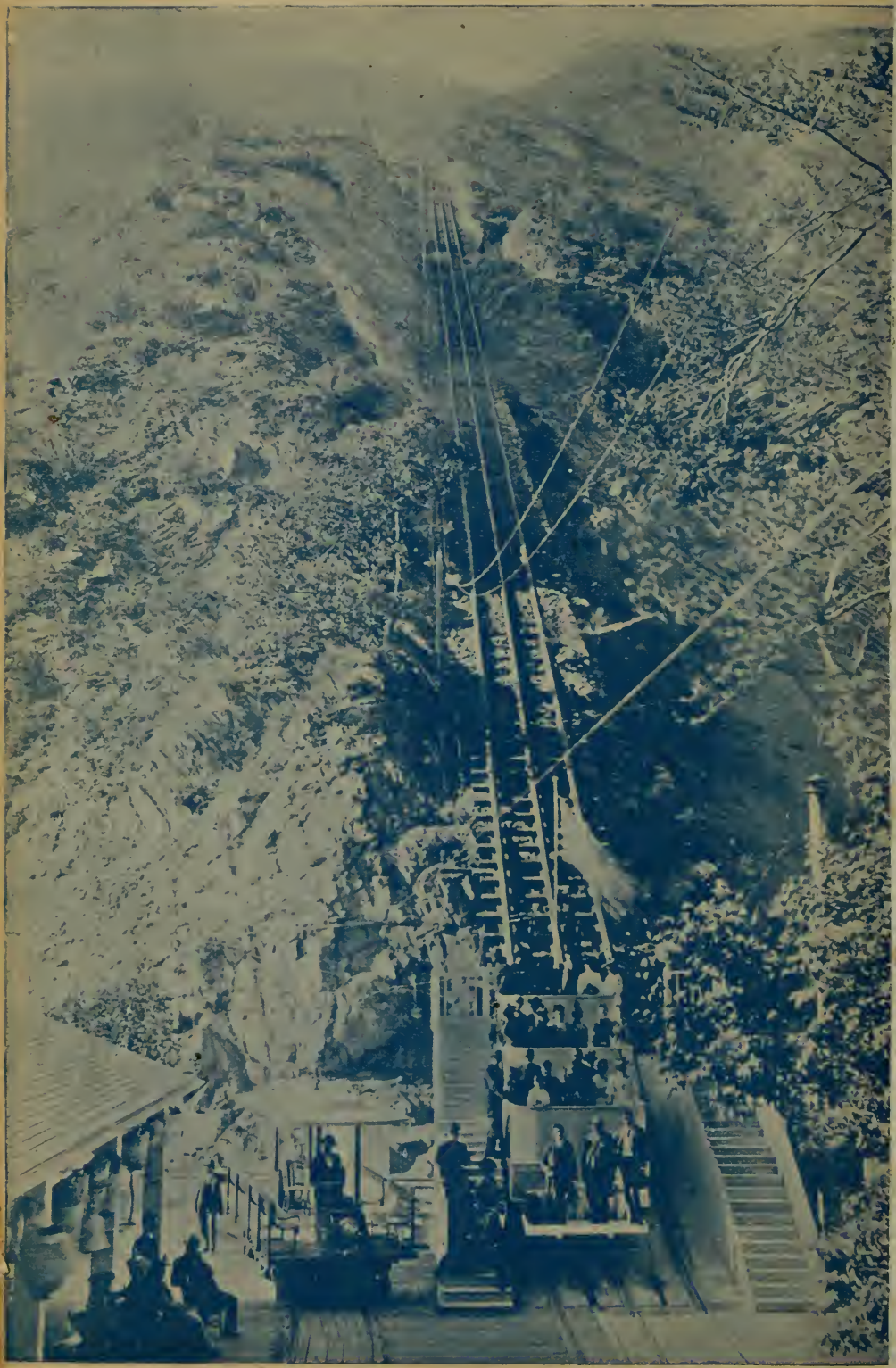
PROFILE NO. 3



PROFILE OF ROPEWAY
BUILT BY
CALIFORNIA WIRE WORKS
FOR
CHILCOOT PASS
1898
NATURAL SCALE

HORIZONTAL DISTANCE BETWEEN TERMINALS 8250ft.
DIFFERENCE OF ELEV. BETWEEN TERMINALS 1070ft
ELEV. OF HIGHEST PT. ABOVE LOWER TERMINAL 1470ft.


CHICAGO 1893
OFFICIAL RIBBON
MEDAL
COLUMBIAN EXHIBITION
Issued by Authority of the
WORLD'S
COLUMBIAN
EXPOSITION
DEPARTMENT OF TRANSPORTATION
PREMIUM AWARDED
SAN FRANCISCO CAL.



THE GREAT INCLINE OF THE MT. LOWE RAILWAY (From a Photograph.)
Pasadena, Los Angeles Co., California. Designed and erected by California Wire Works, San Francisco